

**The Wonder of Magic:  
Eliciting Wonder and Analyzing its Expression**

by

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B.A., Hampshire College (2004)

Submitted to the Program in Media Arts and Sciences,  
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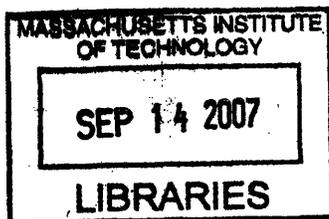
  
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**Abstract**

The wonder that occurs while watching a good magic trick or admiring a gorgeous natural vista is a strong emotion that has not been well studied. Educators, media producers, entertainers, scientists and magicians could all benefit from a more robust understanding of wonder. This exploration proposes a theoretical model for this understanding. Additionally, an experiment was conducted to investigate how several variables affect how magic tricks are enjoyed. The experiment showed 70 subjects 10 videos of magic while recording their responses and reactions to the tricks. Some individuals were shown the explanations to the magic tricks to gauge their impact on enjoyment. The style of the presentation was varied between two groups to compare the effect of magic presented as a story to magic presented as a puzzle. It was discovered that presentation style has an effect on magic enthusiasts' enjoyment and that a storied presentation is associated with individuals being more generous towards a charity. Contrary to magician's beliefs, the explanations had the effect of making people more likely to want more magic later. Other general statistics about magic spectators are also quantified.

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# Part I

## Forematter

## **about magic**

“The first thing a student of magic learns is that there are books about magic and books of magic.”

From *Jonathan Strange and Mr. Norrell*

## **about thanks**

Cullen, for supporting me when I seemed like I was fine, and the pickles

Roz, for letting me do so many silly, crazy things

Glorianna, for reminding me that you can't really measure enjoyment

Nick, for reminding me that my audience include magicians

Mom and Dad and Jona, for, umm, yeah.

Jay, for distracting me in so many wonderful (and important) ways

Alea, for being in my boat

Adobe Systems Incorporated and Duane Nickull for donating Flash Media Server

Grandpa John, for passing on that magic knack



# Chapter 1

## Preface

The format of this document may seem unconventional to those not familiar with magic literature. However, anyone who has picked up a magic book for kids should recognize it. Magic tricks, when being taught in “trickbooks”, are frequently broken down into two parts: effect and method. This separation is akin to showing a picture of a finished dish, followed by a recipe. The recipes themselves just don’t seem get across what the final dishes are like. And though the picture may not convey the subtle textures, smells and flavors of the dish, it does go a long way towards inspiring the imagination.

In a magic textbook, the effect is designed to give the would-be magician a taste of what the magic trick would look like, if it were performed well, by a practiced magician. The methods section, in turn takes the role of providing the directions to get from pastry flour to bunt cake, in and of itself no small magic trick. Without the effect section, there is nothing to grab the novice magician’s imagination, to inspire what could be. The methods to tricks are inherently mundane (they are not real magic) and therefore less interesting. The most amazingly described effect loses a little glamour when the method is learned.

Sometimes, depending on the quality and intended audience of the instructional material, a few other sections may be present. A background section may review the magic trick’s history: who invented which move, who improved upon who’s technique, and who stole

which sleight from who. Sometimes the method section is called “explanation” or “secret.” Occasionally the author will include a section on presentation, containing tips, or suggestions on how to best present the trick to an audience. Frequently, there is an afterthoughts, or footnotes section which provides random tips and thoughts on the effect, which may prove illuminating or useful.

Sometimes there is no distinction between the sections, and they are all woven together in a narrative.

For this thesis, I have adopted the familiar format of the magician’s handbook. I will start with an effect section, describing the overall goal and outcomes of the research presented herein. Then there will be a background section, outlining previous work in this and related areas.

Just as a recipe does not contain every detail on how to perfectly recreate a culinary masterpiece, the “methods” section, too, lacks little ineffable bits of information required to create a truly masterful piece of magic. The master chef, and the college student will create vastly different dishes following the exact same recipes. In order to address this, I have broken the middle of the thesis into two parts: Method and Explanation. The Method section describes in detail how my experiment was designed and executed. The Explanation section goes into detail on how the results may be interpreted and applied in various capacities.

Lastly, I will leave you with some Afterthoughts. Reflections on the process of performing this thesis, thoughts about its overall implications, and ideas looking forward to the future. For that is the goal of this document, to create better magic, and more wonder for all those magical people of the future.

## **Part II**

# **The Study**



## Chapter 2

### Effect

**Effect:** The magician, ever so slowly, pulls the wool over the audience's eyes. So slowly that they don't even notice it. By the time it is all said and done, nobody can speak. Their eyes have widened, their mouths have opened, and the magician is standing there, appreciating the coordinated moment of astonishment she has just unleashed.

**Effect:** The group stares apprehensively. Their feet frozen as competing emotions grapple over control for their muscles. The gaping chasm before them opens wide, made by tiny, nearly imperceptible erosion by water. The grand canyon silently watches as the spectators marvel in disbelief.

**Effect:** The painting stands as still as always, next to countless others of stunning beauty. In front of it, the woman lies, collapsed. Other museum-goers who were not enraptured by pieces of art, watched as she slowly wobbled, felt dizzy, and fainted.

**Effect:** Four people gathered around a woman, their hands twitching with excitement. They did not blink as she slowly rotated the object 90 degrees; when the image on its surface counter-rotated, everyone smiled. Counter to all their expectations, the iPhone really was as marvelous as they had hoped.

## 2.1 Definition of Wonder

The definitions of wonder are varied and woefully full of connotation. While this makes it a wonderful tool for analogy, descriptions, and metaphors, it makes it slightly more difficult to have discussions about specific aspects of it.

Wonder n.

1. a) One that arouses awe, astonishment, surprise, or admiration; a marvel  
b) The emotion aroused by something awe-inspiring, astounding, or marvelous: gazed with wonder at the northern lights.
2. An event inexplicable by the laws of nature; a miracle.
3. A feeling of puzzlement or doubt.

The word “wonder” has several different meanings depending on its use and context. It can be used as a noun, verb, or adjective. The adjective tends to denote something extraordinary or super-human such as “Wonder Woman.” As a verb it means to be curious or in doubt about something. With regard to philosophy, wonder can be seen as distinct from curiosity [32], so we shall set aside curiosity for the moment, and the category of extra-ordinary is too large, and will likewise be restricted from our working definition of the emotion of wonder.

I shall restrict my use in this discussion of wonder to the noun. Still, there are several different interpretations of this noun. The most interesting interpretation for this discussion lets wonder “arouse awe, astonishment, surprise, or admiration” [16]. I shall leave aside “a feeling of puzzlement or doubt” (as “the magical experience is not the experience of a puzzle,” [4]), but bring along the connotations of “miracle” and “surprise.” The key to our limited working definition of wonder is “admiration.” There is something definitely positive about the emotion of wonder. Awe, astonishment, and surprise are all close to wonder, but can lack the positive valence associated with a “sense of wonder.”

Magician and magic philosopher Sam Sharpe has spent much time ruminating on wonder and has a number of different ideas about its root. “Wonder is a feeling, and that its evocation belongs, therefore, to the realm of art, since art is concerned with the intentional arousing and stimulating of feelings” [30, p 193 ]. Wonder has a strong relationship to motivators of learning: “The definition of the emotion of ‘interest’ overlaps with that of the terms ‘curiosity,’ ‘wonder,’ ‘urge to explore or discover,’ and ‘intrinsic motivation’ [18]”.

It is important to recognize that wonder is an emotional response to stimulus. One event is not guaranteed to generate wonder in everyone. “We carry with us the wonder we seek without us” wrote Sir Thomas Brown in *Religio Medici* [30, p 254]. Further, as Sam Sharpe understood, “Wonder has a strange subconscious and indefinable influence on the human ego” Sharpe [30, p 39].

## 2.2 Causes of Wonder

The emotion of wonder can occur at the experience of a variety of different stimuli. These causes can be natural, technological, or human. An enormous mountain can elicit wonder as can a sunset. A piece of technology may be astonishing in its novelty or in its intricacy. Humans can also cause the emotion of wonder in others. Each different cause of wonder has its own characteristics that flavor the experience of the emotion.

The natural environment seems to be a ceaseless source of wonder. For millennia, homo sapiens have stared at the cosmos in wonder, admiring the stars and other celestial bodies. Giant majestic mountains inspire songs, artwork, and other homages to the wonder they can provide. Sunsets, flowers, the Aurora Borealis, and the intricacies of living systems all provide a window through which an observer can steal a glimpse of wonder. Nature’s wonder inspires not only poetry, but also science, an attempt to learn more about the world and the way it works. Though repeated exposure to “natural wonders” it is possible to take them for granted; walking on a glacier every day can reduce its wonder-making ability. On the other hand, the discovery of formerly unobserved natural phenomena can be extraordinarily

wonder-full, as a Southern naturalist witnesses the Northern lights for the first time, or an urban child sees his first living cow.

Technology, likewise, can inspire wondrous feelings. Technology is frequently the application of science, which is in turn inspired by nature. Thus, the feelings of awe at a technology can be similar to an awe at nature: “it is amazing that this panel can turn the sunlight into energy.” Indeed, “[M]ost people today look at technology and see magic” [33]. Frequently, however, the level of technology is well beyond the naive understanding of the technology’s users. Electricity has become commonplace, and a light switch lacks any sense of wonder, even though very few people know how it actually works. The overwhelming rate at which technology is developed and integrated into everyday life has led, again, to the taking for granted of wonder-full events. In a technological society, technology quickly becomes boring and utilitarian, its wondrous aspects diminished [30].

Humans have also taken a more pragmatic approach to the production of wonder. Perhaps in response to the rapidity with which the marvelous becomes mundane, they have sought to create wonder for its own sake. Magicians have the job of doing the impossible, performing “miracles,” and astonishing their audiences; all without making them feel like fools. Eugene Burger believes that a successful magician does more than puzzle the audience or confuse them. Rather, he takes them to a world “in which enchantment *is*, to a world in which wonder and awe are necessary ingredients of a happy and healthy life” [4].

## 2.3 Magicians for all times

An understanding of wonder and how to elicit it would be beneficial to many people. Magicians would appreciate tools to objectively measure the effectiveness of their performances and improve their weaknesses to become more evocative magicians. More insight into wonder’s role in learning would be useful for educators aiming to engage students meaningfully in ways that facilitate their learning. Designers seeking to create toys or products that are “wonder-full” might love standards of measurements through which to demonstrate engagement. The same holds true for media creators who seek to hold and maintain their

audience’s interest through a combination of surprise, mystery, and suspense akin to wonder. Yet, wonder is really the stuff of magicians.

“Conjurors in all parts of the world and in every period of history have always sought to present wonders and mysteries for the astonishment, delight, inspiration and sometimes even horror of their audiences.”

Eugene Burger, 1995 [4]

Conversely, audiences in all parts of the world and in every period of history have sought astonishment, delight, and inspiration in the wonders presented by magicians, and the world around them. What is this experience of wonder that people seek, what causes it, why do they seek it, how does it affect them? This thesis will help to understand these questions, and eventually their answers. Ultimately their answers could help lead to a more wonder-full society, providing tools for educators, entertainers, researchers, and magicians.

## 2.4 Motivation

Being a magician, I am constantly seeking moments and opportunities to create the experience of wonder. That instant of wonder is called different things by different magicians, but is essentially the same: “unleashing the moment” of astonishment [15]. Nor are magicians alone in this pursuit to induce wonder. Educators, entertainers, ministers, and others are all also interested and involved in, either knowingly or unknowingly, this endeavor. Magicians, however, fall into a category all their own. Their charge is not tangentially related to this subject, but wholly dependent on it (though again for some it may be an unacknowledged dependency). Many magicians have placed it squarely at the root of their theories, from which rich magical experiences have grown.

As I go through my day, I make note of minutiae, odd behaviors and coincidences that may aid me in my quest to make the impossible occur; what was the year on that quarter you just put in your pocket, is her phone number divisible by 9, how many cheese graters

are in the immediate vicinity. Very few of these tiny details ever actually become magic tricks, but a lucky few of them become seeds which will germinate into astonishing magical moments. They (combined with their secret use) are not enough to create wonder. There are a multitude of other aspects which contribute to the effectiveness of a trick; the character, presentation, context, relevance and attitudes of the performer and the participant all help determine what the result will be: wonder, mild interest, fear, or frustration?

Yet, assuming all of these factors line up, there is still no guarantee that wonder will result. I want to create more wonder in this world.

The path that has led me to this thesis has taken me through a number of different approaches. The questions I am asking stem from my interest in magic, and a number of unexplained results in my undergraduate thesis. I began exploring the area of wonder expression in the Spring of 2006, with a number of experiments in recording facial expressions en masse during magic performances. I also performed experiments examining the relation of secrets to the success of magic. During the summer of 2006, I collected data in China on how people express wonder in order to compare it with results from American spectators. In the Fall of 2006, I began designing experiments and software to recognize the emotion of wonder as expressed through facial expressions.

I am now focused on wonder and its role in helping people learn more about the world. I have developed a theory which places wonder within the space of possible reactions to the violation of expectations, and I have several hypotheses about its effect on intrinsic motivation to learn and to resolve unexplained phenomena.

Magicians are liars. They get paid to stand in front of audiences and deceive them. Do they also lie to each other? Among magicians, advice is frequently given. Those whose interest in magic lies deeper than just the perfunctory magic kit at the 10th birthday frequently start to look further for better methods. Not better methods for specific tricks, but better methods for creating wonder, entertainment, engagement, character, and memorable performances. There are books, workshops, and mentors available to those interested, but the investment in time, energy, practice, and money is often much higher than the cost of mere secrets.

The advice is frequently on what makes good magic, as Tommy Wonder opines:

“It is highly desirable not to push spectators into the role of detectives on the trail of your secrets, because it can make your job harder; and, what is more important, it can prevent your audience from experiencing other elements of your performance, elements capable of far greater entertainment potential than mere puzzlery can offer. Good magic has so much more to give than puzzlement” [37, p 35].

This advice is garnered not from scientific experimentation, but through years of experience performing for real people and gauging their responses. Yet, it is not always so straightforward to take an expert’s advice. The famous magician “Nevil Maskelyne never disclosed the methods used in any of his own or other conjurers’ illusions, which hardly seems to fit in with his theory that the secrets of magic are of little importance and should be available to all” [30, p 244]. It seems that a well-polished performer should take his own advice. . . if it is worthy advice. But then again, magicians have a reputation for misleading others.

The advice also changes based on the magician. The very well respected Eugene Burger says, “I think secrets are important” [5]. Okay. On the other hand, the extraordinarily successful Penn and Teller give their secrets away with seeming disregard for the millennia of taboo that magicians have built against it. Not to mention that “[t]here is a vast difference between telling how a trick is done and teaching how to do it” [17].

In my thesis, I have uncovered some of the underlying truth of two of magicians biggest and most controversial claims. The first belief is that presentation is paramount in the performance of good magic. The second is that you must never, at any cost, for any reason, under any circumstance, tell the spectator how the magic is done. Of course there are countless examples of anecdotes on both sides of each argument. I shall attempt to bring my examination to bear as well.

## 2.5 Value of my work

The cited benefits and importance of the subject is contrasted with a dearth of scholarly exploration. Wonder is distinct from the emotion of curiosity. Curiosity, which may arise from an experience of wonder, has been studied and its causes considered. Wonder, on the other hand has not been studied in depth. My goal is to provide tools for those interested in creating and studying wonder, with the end goal of adding to the net sum of wonder in the world.

This thesis will help advance the study of wonder both theoretically and practically. It will develop and test several different technologies and methods of measuring and identifying wonder in spectators. It will then use the technologies to test novel and existing theories about the nature of wonder. The results of these experiments will lead to more knowledge about the way wonder affects people, how to elicit it, and how it relates to curiosity. It provides a new way of discussing an important, but understudied field.

## 2.6 Holographic rabbit

Sam Sharpe, someone who has written many words on wonder said “In our modern world, which teems with wonderful inventions, we tend to wonder less and less owing to a surfeit of wonders. The commonplace never seems very wonderful unless its wondrous nature is emphasized; and the utilitarian application of scientific discoveries has made them very, very, commonplace” [30, p 195].

A friend told me this story: he was performing at a birthday party for a young boy around the age of 10. The family had quite a bit of money, and the house was adorned with all the newest and greatest electronics and gizmos. The tricks he performed were standard fare, engaging both the children and their parents as well. Sleight of hand, bright colors, and entertainment. People seemed to be enjoying themselves. Then came the grand finale. The magician took off his top hat, showed it around the room to be empty. He then placed it on the table, made a magical gesture, and perhaps uttered an incantation. He lifted the hat

to reveal a white, fluffy bunny. A classic magic trick and a classy end to a run of the mill birthday party. At the end of the show, the magician started packing up. The birthday boy, seated near the magician, was staring off to the left of the table at the magician's props. He would not stop staring. His curiosity piqued, the magician asked him what he was staring at. "I am looking for the laser," said the kid, "I know that rabbit was a hologram."



## Chapter 3

# Background

I am by no means the first person to study wonder. Magicians study wonder. Philosophers study wonder. Marketers study wonder. Educators study wonder. Babies study wonder. Just about everyone studies wonder at some time in their life.

Wonder has been placed near the center of various academic domains. Both Plato and Aristotle place it at the crux of philosophy [32]; Plato claiming, “the sense of wonder is the mark of the philosopher. Philosophy indeed has no other origin,” [27] and Aristotle believing that man’s philosophizing ” is owing to his wonder” [3]. Einstein, the eminent physicist, claimed that someone without wonder “is as good as dead.” Wonder is important to scientific discovery, in fact it may play as large a role in science as it does in philosophy. Its connection to curiosity brings it into the process of learning and, ideally, education. The emotion of wonder is also of utmost importance to the field of magic and to the magician who seeks to instill it in his audience.

A wide variety of disciplines have recognized the importance of wonder in everyday life and learning in particular. For example, in designing museums for children, curators continue to ensure that a “sense of wonder is alive in children’s museums - on many levels” [Edeiken, 1992]. Educators have recognized the extraordinary importance of wonder in education acknowledging that “the sense of wonder is a key tool in our initial explorations of reality” [Egan, 2005] and that “wonder is the germinal seed of science” [Silverman, 1989].

There has been a tradition in both education and philosophy to separate wonder from curiosity. “There is a need to distinguish between curiosity. . . and the state of mind called wonder” [Opdal, 2001] in particular when Heidegger considers curiosity the “thief of wonder” [32]. Wonder may be what initiates children to seek ” to find a coherent causal representation of perceptual input” [Gopnik, 1998] References to wonder exist across many disciplines, but lack a fulcrum in any one domain.

Magicians, being in the business of wonder, have spent much time thinking about it. They have developed theories of what it is, what causes it, and the best ways of fostering it. For centuries, magicians have been pondering over what the right mixture of presentation, technology, and psychology is to maximize that feeling. They have practiced eliciting it and grown adept at gauging its strength by people’s reactions. Along the way, a folklore both oral and written has grown around the subject and most magicians hold some beliefs, either explicit or implicit, about the nature of wonder. However, very few of these theories have been empirically tested or measured, rendering their debate not only uncommon, but generally ideological.

### 3.1 Literature Review

Recently there has been an increase in the number of books addressing wonder in particular. Magic has been experiencing another renaissance, being popularized by TV shows such as David Blaine’s Street Magic specials and Chris Angel’s MindFreak. The advent of the Internet has also had a kindling effect on magic as a large portion of the Internet’s users match the demographic of new magicians (“90 percent of all magicians are teenaged boys” claims long-time professional Jason Randall). Following is an overview of the most pertinent works relating to the study of wonder.

Fred Nadis and Simon During have both recently published books discussing Wonder. Nadis’ book, *Wonder Shows* looks at just that, events that purport to spread wonder. He looks at the performances of magicians, snake-oil salesmen, and early traveling science “wonder shows” that titillated audiences and elicited wonder throughout American history

[[Nadis:2005]. Simon During has attempted to understand the many ways in which conjuring performances have molded and affected our current cultural heritage in his book *Modern Enchantments*. By mapping how magicians' have historically played a large role in public life and entertainment he shows how they have affected current day behaviors. Like Nadis, he reviews the evolution of performance through America, however he focuses mainly on conjurers.

Jason Randall wrote *The Psychology of Deception*[28]. It was an attempt to understand and identify the various aspects of magicians' performance that led to successful deception. He looked at how the perceived level of skill of the magician affected how the magic was received. He also looked at how descriptions of what the magician did during the show were exaggerated after the show, according to how well the magician was liked. He began to take a social scientist's approach to the analysis of the magician's trade in an effort to extrapolate to other areas of application.

The magic literature deals extensively with many of the topics addressed in this thesis, to varying degrees. Many magicians express their opinions, garnered through years of experience, on how to perform good magic.

Tommy Wonder said, "Sometimes, when a performer gets me involved – really involved – in his performance, it is not important to me if I understand the method of the trick" [37]. Here we see a number of magicians hidden assumptions. Wonder believes that emotional involvement is a key to making performances stronger. At the same time, he reveals that magicians don't want spectators to worry or think about the method of the trick.

This type of advice is scattered through "trickbooks" magicians own in which the secret methods to their favorite tricks (or effects) are revealed. It is even more common in books consisting solely of these "secrets" of presentation like Darwin Ortiz's *Strong Magic*. It is a recipe book describing how to take the magic tricks a magician already knows how to do technically, and improve them to make them stronger. "I know that when magicians speak of technique they mean sleight-of-hand moves. But there is another body of technique at least as important to your success as an entertainer: the theatrical and psychological techniques you employ to elicit the kind of reaction you want from an audience" [23, p 16].

Almost all of these books focus on presentation. “Every magical effect is basically an illusion. The extent to which it seems magical will depend on the way in which it is presented. If it is presented as a puzzle or a scientific curiosity, or a trick, it may not seem truly magical at all” [30, p 249]. Other important aspects include character development, the refinement of misdirection, and timing.

Over all, magicians are trying to raise the quality of magic being performed. They do this out of a love of magic, the feelings it can engender, and a desire to help improve magic’s perception among the public.

“The overriding presentational message broadcast in most manipulative acts is ‘Look at the clever things I can do! Aren’t I good!’ Such performers may be reasonably clever in their methods, and their execution of them might be excellent; but they are far from clever or skilled in their understanding of theater and presentation. The result is, at best, that their audiences think, ‘Well, yes, he does do that rather well,’ in the same way they appreciate a trained seal doing stunts.”

Tommy Wonder, 1996 [37]

It seems that many magicians are afraid of being stunt seals, merely making their fingers follow the diagrams in their precious trickbooks. These magicians hope to elevate magic into a true art and in so doing spread its appreciation.

Dr Gustav Kuhn at the University of Durham has also studied magic. His interest lies close to that of Randall’s interest in deception. Kuhn is interested in misdirection. He has taken a psychological approach to dissecting magic tricks to discover why misdirection works. He has examined whether it is enough for a magician to manipulate where the spectator is looking, or if you must also manipulate their visual attention as well [19]. He has looked at attention and learning as well. Using eye-tracking and other behavioral measures, Kuhn has undertaken the task of understanding misdirection better.

Ben Parris, at the University of Exeter, has also been involved in studying the underlying mechanisms that make magic work. His work has looked at what happens when causal

relationships are violated. By placing subjects in an MRI while they watch magic tricks, he has explored what parts of the brain are involved in the resolution of expectation violation. The assumption is that these events are useful in the generation of new knowledge and that understanding them better would be beneficial [35].

As seen above, there are a number recently published popular books, addressing the role wonder plays in our lives both presently and historically. Magicians have written and theorized about it, but due to its nature of secrecy, “the business of entertainment magic has found it difficult to build up a tradition that could be used as the basis for assessing performances, in the way that high-cultural forms like drama and literature have” [10, p 74]. Historically, there have been cursory and philosophical discussions but no scientific exploration. Scientists have only just begun to recognize the value magic can play in understanding various other phenomena related to attention, psychology, and learning. This work should be a jumping off point from which to continue exploring and studying why we have wonder, and how it affects us. It should provide a framework and tools to study wonder.

## 3.2 My Previous Work

In the study of wonder, it would be useful to have a metric by which to measure it. However, as wonder is an emotion, it cannot be sensed in others directly (except through ESP), rather its presence is signaled by cues such as facial expressions, auditory gasps, and whole-body responses. There are a variety of responses that indicate a successful conveyance of wonder. A good magician should be able to actively judge, in real time, how much wonder an audience is experiencing and to dynamically change his performance to improve its occurrence. In order to build tools or design metrics for evaluating and quantifying wonder, it is our challenge to identify how magicians make this judgment.

A wonder-struck audience may be completely silent. Or they may gasp audibly. Genuine laughter may arise from a moment of astonishment, and nervous laughter may accompany a demonstration of the impossible. Visible changes may also be observable in the face or

whole body. The lips may purse or pucker, the lips may pull wide in a smile. Eyebrows may curve or arch and nostrils flare. All of these are common responses witnessed by a magic performer. Other changes may happen in the body as well, not as easily observed. The palms sweat more at the moment of excitement, increasing skin conductance measurably [26]. Heart rate variability may be affected as well as breathing rate.

It is possible to measure some of these directly using technology. Skin conductance, for example can be measured by a glove-like device with electrodes [26] and has been used to measure the response of an audience during a music performance [34]. Likewise, heart rate and breathing may be directly measured. Facial expressions are slightly trickier to measure but developments in computer vision make it possible to begin objectively measuring wonder displayed on faces. [11]

I have experimented with a number of these measures in preparation for this study.

### **3.2.1 Audience Cam**

In my early attempts to measure wonder, I worked with Alea Teeters to develop tools for recording the wonder-response. The goal was to investigate the emotion of wonder, how it is expressed, and how watching other people expressing wonder can affect a secondary viewer. We used shoulder-mounted video cameras, “self-cams”, to record audience reactions to magic tricks. A montage of the footage was created and shown as a separate performance. In some cases, the montage of peoples’ faces received better reactions than the original performance. This tool was also very useful in evaluating the effectiveness of the magic show. By comparing reactions across magic effects, the more powerful ones can be identified, and areas for improvement can be discovered.

Each subject is given a video camera mounted on a lightweight wire frame. This frame is worn around the neck and positions the camera several feet from the performers face. The camera is pointed at the subject and records their facial expressions and head movement [36]. These cameras can be connected to portable computers worn on the hip which process the facial data to “analyze social-emotional information” using “recent advances and

methodologies in three key scientific and technical areas – affective computing, wearable computing and real time machine perception” [11].

The first use of these cameras for exploring the emotion of wonder occurred in a theater. A magic show was advertised and subjects culled from the audience who volunteered to wear the self-cams. Of all the people in the audience, 14 of them had their reactions recorded, as did the performer. The footage of the audience members was edited with that of the performer and analyzed synchronously by human researchers.

The camera setup was subsequently used in a number of performing environments near Boston, MA. Another group of subjects were recorded in informal performances around a college campus. This was repeated in Beijing, China for students and others around a college campus. The recorded responses were then compared to look for clues as to how wonder is signaled and how is it shown across gender, culture, and age. This pilot study was designed to establish a method for data collection and to look for potential patterns.

There are a number of salient features that occur when most people experience wonder. The most prominent is a change in mouth posture. There seems to be an immediate tensing of the lips as the mouth pulls into a slight smile. This is sometimes followed by either a widening of the eyes signaling surprise, or a narrowing of the eyes indicating concentration or focus. Occasionally the mouth will pucker instead of widen. In many instances, the eyebrows arch, either individually or together. There appears to be no stereotyped “wonder response” but instead a variety of facial actions that, when experienced in concert may indicate wonder.

### **3.2.2 Wonder Watchers**

Magic is a very old art form. The earliest forms of magic were witnessed by live audience members. Then these experiences were shared with others, and so the initial magical event spread through the community. More recently, David Copperfield has performed grand illusions in front of live audiences broadcast around the world on network specials. But, since Copperfield, magic has ceased to be a popular TV subject. The problem: it is difficult

Figure 3-1: Faces of Wonder



to convey the wonder of an event when viewed through a medium rife with technology: camera tricks, editing, and trick photography (magic tricks of their own kind). The next rebirth in television magic was with Doug Henning who brought a whole new type of magic to the screen. But, again its popularity died down. Recently David Blaine has recreated an interest in magic programming with his recent special, "Street Magic". This time, it stuck. Not only did Blaine continue to have more specials (as Copperfield), but many other programs began appearing on television too. Magicians like Chris Angel, Alain Nu, and Derren Brown all have starred in new magic related television series.

What is different? David Blaine changed the focus of magic on TV. Where as before Copperfield broadcasted illusions too large for normal venues, and Henning had been performing smaller magic in a studio, Blaine took his magic to the streets. But, more than that, he made the show about the people in the streets. During one of his magic tricks, spectators and their faces can be visible on the screen for upwards of 60% of the time. This is a vast difference from watching Copperfield dance across a stage as the large audience sits in a darkened theater. Suddenly, the magic (which really occurs in the minds of those watching) is communicated through gasps, facial expressions, and expletives. People like watching other people, perhaps even more than watching magic! Now Copperfield is interesting to watch, to a point, but people's reactions can keep people amused for years. The new TV specials exploit this by allowing the magic to happen between two parties, the magician and the 'studio' audience. This relationship sells on TV.

In order to investigate this claim we redacted the data collected above into a separate product, after it had been examined for similarities in the expression of wonder. This product was a movie composed almost entirely of audience reactions, and relatively little footage of the performer. This film was then shown to a new audience and their reactions observed. The result was astonishing. At times the redacted version achieved a better reaction than the original performance had. While there were only subjects' faces visible on the screen, the second audience displayed only passing interest in the movie. But when the many faces of audience members were joined by a narrative frame showing the action on stage, the secondary reactions became much more pronounced. This suggests that people

Figure 3-2: A composite of 14 audience members watching magic



use the reactions of others to gauge and establish their own level of reaction to magic, as they do with humor and other emotions.

### 3.2.3 Open Source Magic

Another of my early experiments examined the nature and role of secrets with regard to the performance of magic. The experiment was the performance of a magic show entitled *Open Source Magic*. This show was advertised as an opportunity not only to watch magic, but also to learn and help improve the magic tricks that comprised the show. The concept is borrowed from the idea of Open Source Software (OSS).

In closed source software, the model is to keep the underlying source code of a computer application secret. You then sell only the final, unchanging version which you hope will work for enough people that it will be useful. In OSS, you write a program (sometimes collaboratively) and allow anyone to change the source code, changing it, fixing it, improving it, and modifying it to their own needs. Frequently these changes are provided back to the community, and software is developed by many people, for free, creating a valuable, sturdy, and more flexible solution to computer needs than closed source software can. Because anyone (with the proper technical prowess) can take the program and change it to meet their needs, the software can be useful to more people. Examples of successful OSS projects include Linux, an operating system more robust and durable than Windows, Firefox, a more secure and standards compliant web browser than Internet Explorer, and countless other powerful programs like those used to evaluate the statistical data later in this document, and indeed, even to lay this document out graphically for printing.

I attempted to bring this model into the performance of magic. I advertised the performance as an open source magic show. The spectators were invited to learn the secrets at the conclusion of the magic show. The initial plan was to distribute CDs at the conclusion of the show, in order to allow the spectators to take the plunge, and become performers. This is one of the premises of participatory culture, turning consumers into producers. However, while many people may download OSS like Firefox and use it, the real benefit is when the

users help contribute and make the project better. So, I decided to offer the secrets of the magic at the conclusion of the show and open myself to feedback. After the magic was over, I announced that it was time for the explanation session, and those who did not want to learn the secrets were encouraged to leave. At that point, I went through, trick by trick and explained how they were done. The audience then began to comment on what they thought the strong points were, and what did not go over as well. They were doing what open source software contributors do: fixing bugs.

The performance took place at MIT, so most of the people there were familiar with the open source movement. It also means they were technically minded people who like knowing how things work: many of them had contributed in one way or another to Open Source Software. However, within the larger population, very few who use OSS are contributors. The majority just download and enjoy the fruits of the community's labor. This is great, it allows many people without the technical inclination to enjoy good quality software. So, while the audience at MIT were very interested in learning the secret ins and outs of the magic show, the vast majority of audience members do not want to become magicians themselves. They merely want to enjoy good quality magic. So, the practice of disseminating the secrets of magic at the conclusion of a magic show does not make sense for most magicians.

Yet, the idea of creating a culture in magic where secrets are openly shared and improved upon may hold traction. The important distinction is who the audience of such a project would be. As it would be rude to show regular users the source code of their Operating System if they did not want to see it, it would be rude to show spectators the secrets if they did not so desire. However, for magicians, there may be much to be gained from open collaboration and improvement of tricks. It is already the case to some degree within the magic community with workshops and the slow improvement of one person's methods over another's. The larger gain, in my opinion, would be to create a magic community which advertised its openness to all who were interested, and offered good quality magic to the rest.

### 3.2.4 Child Study in Mexico

In 2002, I performed a cross-cultural experiment on children's perception of magic. My experiment was based on an experiment performed by K Phelps and J Wooley in the United States. The purpose of their study, titled *The form and function of young children's magical beliefs* was to examine how children understand the concept of magic. I replicated their study in Mexico in an attempt to make cross cultural comparisons.

They attempted to discover what children thought was 'real magic' and how their knowledge of causal explanations affected their labeling. The experimenters presented children with a number of different phenomena that had varying degrees of novelty including a piece of foam that changed colors with heat, a little vial of liquid that boils with the heat of your hand, and a trick vase which can make a ball appear. The children were then asked A) if they know how it was done, and B) if they thought it was 'real magic'. Their results were pretty straightforward. As children grow older, from 4 to 8 years old, they knew how more of the novelties worked, and directly correlated to that, they decreased their attribution of 'real magic'. So, if kids knew how it was done, they did not think that it was magic [25].

I repeated the experiment in Mexico using their original items, and another magic trick involving a Palm Pilot, to see what the presence of a purely technological magic trick would have. The results in Mexico were similar in that as children grew older they knew how more of the tricks were done, but there was a large difference. Some magic tricks would continue to be described as 'real magic' even if they knew how the trick worked. The difference between 'real magic' and 'just a trick' seemed to not be as strongly correlated to whether or not the child had a causal explanation for the experience.

This result reveals a different cultural understanding of magic in Mexico. It could be in part due the difficulty of translating the word magic, with all of its nuances, or other words used in the study, like "adas." Fairies are not nearly as common in Mexican children's literature or folk tales.

My work in Mexico uncovered some of the complexity of magic's role. Not only did the cultural differences shed light on the many dimensions involved in interpreting magic, but

other, more subtle things presented themselves as well. One young girl stoically claimed every single trick was done by ‘real magic’, even if she knew how it was done until the last trick. That one, the only one involving technology, she claimed was “just a trick.”

### 3.2.5 Cultural Differences

Phelp’s finding that causal explanations are inherently contrary to wonder or the experience of magic is likely highly cultural as my previous work has alluded. There are also other inter-cultural differences, some of which I observed in China. The following description of events is intended to portray the robust way in which magic is appreciated around the world, and even within communities. China has historically been fetishized by magicians, for whom Orientalism is still the pinnacle of some performer’s patter. The Chinese Linking Rings were not invented in China (though I did buy a set there), but the false history has become popular. My observations in Mexico and China are samples from the large range of possible reactions and are not meant to typify either population.

There are a number of differences to be expected across cultures, with regard to wonder. One of the first difficulties is in translation. As evidenced by the difficulty of coming up with a working definition for wonder, it is even more difficult to translate the subtlety into other languages. As I mentioned earlier, the translation of ‘magic’, ‘fairies’, and other words into Spanish was tricky because of the complexity of context, usage, and connotations. Another example is Spanish’s lack of a direct translation for “wonder.” The most frequently proffered counterpart for our noun (both by native speakers and dictionaries) is “maravilla.” Retranslated into English, this word means marvel, root of marvelous. This word lacks certain connotations that I am interested in. Darwin Ortiz has also had trouble translating magic vernacular into Spanish, once having retranslated back into English the, now nonsensical, phrase “to illusioning” [24].

Other concerns in cross-cultural variation in the expression of wonder have to do with cultural differences. Facial expressions are part innate and part learned. They can play a role in communicating feelings for social purposes, as well as communicate social status.

Facial expressions and reactions such as auditory gasps or exclamations associated with wonder may differ from culture to culture. [13]

There also exist intra-cultural differences. One big difference observed while performing the experiment in China was the contrast in responses between generations and classes. As it was graduation day at the Beijing University campus, students were accompanied by their parents and vendors were present. During the experiment students tended to be more reserved than their parents who were more vocal and more visibly entertained. The vendors however, likely of lesser education and of a different class, enjoyed the show most visibly. Their faces were the most expressive; they incredulously called their friends over to watch and were generally less inhibited in their experience of wonder.

The context in which an event occurs naturally has a tremendous effect on how much wonder it induces. When in the context of a magic show, the disappearance of a spectator's watch is entertaining; in a crowd on the street, the same experience has a very different effect on the witness. Also, socio-cultural context plays a role in determining how someone will react. Are the spectators comfortable with their peers and the environment?

All of these things play a large role in how magic can be appreciated. The cultural understanding of magic, gender and class roles, education, and people's level of comfort while watching magic. Together they dictate and mediate how the response to wonder is exhibited.

### **3.3 My Model of Wonder**

Over the course of this research I have developed a number of models to aid in understanding how wonder works. These look at how wonder relates to other similar emotions and responses to the unexpected. They also look at how wonder is useful to people of different ages, and why people have always liked magic. These models have been assembled by bringing together anecdotes from my own history performing, as well as adages commonly accepted by magicians. They are formalized here, not in the hopes that they are perfectly correct, but that they will provide a stepping stone from which to test the waters of wonder

and from which to make more robust and usable models.

### **3.3.1 Expectation Violation**

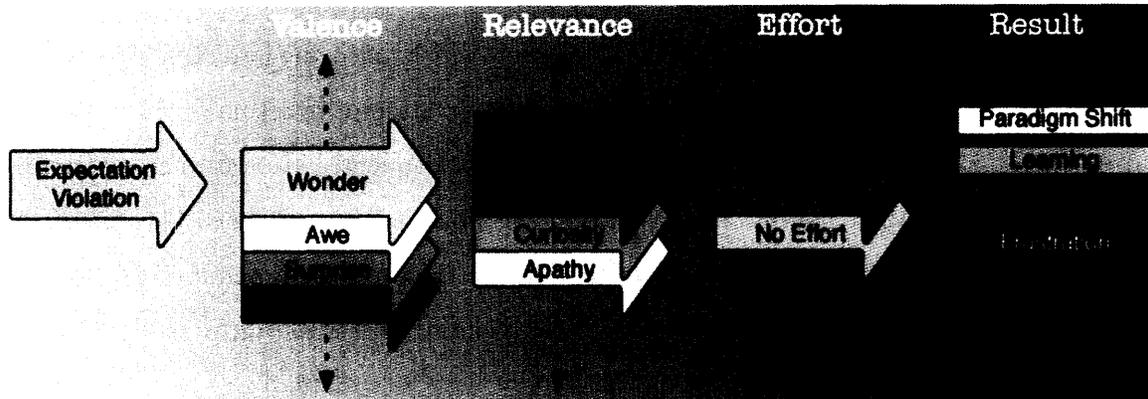
This theory places wonder as a positive response to the unexpected. When something out of the ordinary happens, an individual's expectations are violated. This event elicits an initial response from the individual based on context. If a bear jumps out of the woods, startling you, your response would most likely be fear. If your colleagues jump at you yelling "Happy Birthday" you are more likely to be surprised. Even more positive responses are the emotions of awe and wonder. This scale of initial reaction is based on Valence, or the affective value of the experience.

The subsequent state that expectation leaves you in is determined by relevance. After the initial shock has begun to fade, the interest that remains is based on how relevant this new evidence is to you. "The interest that an audience takes in any routine will depend largely on its theme. The value of any theme depends in turn on its interest for a particular audience" [p. 36][Nelms:2000]. If it has no relevance, apathy may result. However, if it was an extremely important belief that had been violated, a state of obsession may result. Varying the amount of relevance can bring about different states such as interest or curiosity.

This state then dictates how much effort is put into resolving the conflict. The original conviction that was contradicted by some evidence may need to be amended. Finding a model that accommodates the new evidence may take a lot of effort, depending on how deficient the original model was, and how difficult it will be to discover a new model.

The end result of expectation violation depends on the interaction of these variables. If an interesting event leads to enough effort to overcome a fundamentally wrong previous assumption, paradigm shift can occur. This is what happens when children realize that weight is not based on size, and what happened when the Earth was discovered to be spherical. A slightly less wrong assumption may lead to incremental learning. If there is no relevance, or not enough evidence, abeyance may be the end result, leaving the unexplained phenomenon to either disappear, or to reexamine it if it should happen again. If, however

Figure 3-3: Chain of Wonder



there was much relevance, much effort, but no new accommodating model can be discerned, frustration may result. Frustration may also occur if much effort is placed into resolving it, but the resulting new model is not sufficiently different to have warranted the work needed to resolve it. Frequently that is the case with magic tricks whose secrets are small tricks.

Different people seek different paths through this chain. Magicians strive to bring people from expectation violation into wonder and cut off any further processing. Their goal is to foster that emotion and encourage its experience. Teachers on the other hand are focused on learning, and occasionally paradigm shift. Their goal is to have the right amount of relevance lead to the right amount of effort, resulting in education. Too little effort may not engage the students enough to create lasting memory, and too much effort may turn them off to the process of learning. For them, being able to provide interesting experiences of expectation violation to facilitate students through the path of wonder.

### 3.3.2 My Theory of Wonder

“There is a need to distinguish between curiosity, conceived of as a confident and focused interest to find something out, and the state of mind called wonder” [22]. My theory of wonder separates wonder from curiosity, and attempts to position it with relation to learning. The phrase “I wonder” implies curiosity of an inherent motivation to learn or

resolve some unknown. While this curiosity is a valid response to the emotion of wonder, it is not the only, or even a necessary response.

For some people, the emotion of wonder is like a spur, which, once dug into their side, incites a passion for discovery. Experiencing wonder leads to an attempt to reconcile the unknown, to understand the true cause of the unexpected. This frequently leads to more surprises, more wonder, and the exploration continues in the wonder cycle. Richard Feynman is in this camp. For him, “a science knowledge only adds to the excitement and mystery and the awe of a flower” which in turn, incites even more scientific questions [12, p 2].

For other people, it is not so. For some, the deflation of something wonder-ful into something scientifically knowable seems to squash wonder. It seems that the rationalization of one hitherto inexplicable event is tantamount to the rationalization of all such events. Sam Sharpe is in this camp: for “every great illusion, whether in life or on the stage, [knowing] its secret strips it of glamour and romance and leaves behind nothing but dis-illusion” [30, p 239]. It is as if on learning that the magician’s first trick was done with smoke and mirrors, then they all must be done in some similar way. This line of thinking can lead one step forward: because all magic tricks are done in some mundane way, none of them are worth watching.

The first class of person feels sorry for the second, and wishes they could enjoy the deep wonder they know and experience. The second feels sorry for the first in their inability to ever sit and marvel at the wonder they experience. For the first class, everything is knowable and should be known. For the second, the experience itself is paramount. This is the “sphere of divine wonder, where the pairs of opposites have been polarized” [30, p 144]. This smells like another collision between the classic and the Romantic. (My choice of capitalization may tip my hand).

The existence of the second group of people, those who revel in the marvel, may owe their attitudes in part, to the current education system. Its focus on rote memorization and its attempts to mechanize even the arts does seem to drain the magic out of the world around us. By implying that every question has a correct answer, and that the only important thing

is to know that answer, wonder can be effectively removed from the equation of learning. This is a fundamental error, and a travesty for the many children forced to endure the public education system.

My theory of learning is tied to my theory of wonder. To explain why people like magic, I have broken the rewards for wonder and learning apart. The motivation for learning can be both extrinsic and intrinsic. For my model I am interested in the extrinsic reward for learning. That is, things that actually aid you in real life that result from learning. Learning that the stove will burn you has an extrinsic reward in that you won't burn yourself on it (again). It is this extrinsic motivation, the actual positive results of learning that I focus on.

With regard to wonder, I am focused on the intrinsic reward. It feels good to wonder, a positive response to expectation violation. Over time, wonder has a positive reward in that it facilitates learning.

“A child’s world is fresh and new and beautiful, full of wonder and excitement. It is our misfortune that for most of us that clear-eyed vision, that true instinct for what is beautiful and awe-inspiring, is dimmed and even lost before we reach adulthood. If I had influence with the good fairy who is supposed to preside over the christening of all children I should ask that her gift to each child be a sense of wonder so indestructible that it would last throughout life, as an unfailing antidote against the boredom and disenchantments of later years, the sterile preoccupation with things that are artificial, the alienation from the sources of our strength.”

Rachel Carson, *The Sense of Wonder*, 1965 [6]

A positive, internal, reinforcement for wonder would encourage the seeking out of new things, things that violate your expectations. My theory is that this positive reinforcement is constant throughout age. The thrill of experiencing the emotion of wonder can be just as strong as an adult as when you were a child.

Compare this to the extrinsic reward for learning. The extrinsic reward is the ability to do things, and survive better in the world. As a child, almost everything you learn has a tremendous impact on your ability to survive, and therefore learning has a very high reward. As you grow older, however, a more robust world model means that the relative payoff for learning new things is generally small. Therefore, learning becomes less desirable over time. It is believed that with learning, “expectations about future reinforcements, rather than associative bonds created by past reinforcements,” are more important [9] . Hence, the diminishing returns on learning information decreases its value as a motivational force.

Correspondingly, we experience less violation of expectations, and therefore less wonder. However, wonder’s intrinsic motivation does not fade. Adults must therefore cherish any bit that we experience; finding something new and unexpected may provide a relatively high intrinsic reward, while learning what the causal explanation has a lower extrinsic reward. So, if the reward for learning is not as high as that for wonder, you could experience disappointment at losing a future opportunity for wonder at a small gain in knowledge. “Magic, at its best, awakens childlike wonder in audiences” [23, p 126].

This theory applies only in the general domain. In a specific domain which has high relevance to an individual, the value of learning never decreases. For instance, a banker learning a new method of adding large numbers faster may have a higher reward than someone who avoids numbers at all costs. Their specialized knowledge and interests inverts the relationship between wonder and learning, making education more valuable than the emotion of wonder.

### **3.3.3 Not how, But Whether**

Magic tricks would seem to fall in the general domain category. Learning how to do a magic trick will not help most people in their daily life. However, magic tricks some times seem to be very applicable to individual life. For instance, it would be very practical to learn how to make coins appear from thin air. Yet, there are still people who do not want to know how this is done by magicians. This requires analysis of another aspect of performance magic.

When you watch a magic trick, even if you know it is a trick, there is still a willing suspension of disbelief. You try to put the knowledge that it is a trick out of your mind to enjoy the impossibility of what you are witnessing. The same happens in the theater as you watch actors pretending to be other than they are. To enjoy the show, you accept what they present you as the truth. The difference is that at the end of the play, it is easy to accept that the actors have gone home and are leading their own lives and that everything you saw on stage was just make-believe. With the magician, you can accept that he is at home living his life, but that does not change the fact that on stage you witnessed impossible acts. When the magician leaves the stage, you are still left with the memory of the evidence he provided. Your senses are still ringing with the dissonance of having witnessed contradictory signals.

In this sense it is more than just a willing suspension of disbelief. It is unwilling suspension of disbelief. Even though cognitively you may know that what you witnessed was impossible and must have a rational explanation, the apparent non-existence of that explanation makes it very difficult to unsuspend your disbelief. This leaves you in a state where the lack of an explanation creates a lingering possibility that what you just witnessed was indeed magic, an anomaly or aberrance of the natural order. This state of uncertainty is one part of the attraction of magic. In 1946 James Agate, a drama critic, after watching a magic show wrote in the *Sunday Times*, “I desperately want to know not how these things are done, but whether” [30, 142].

When it is discovered that in fact, there was a secret method behind the apparent magic, that feeling is deflated. There is no longer any suspense, or interest in that aspect of the trick. They gain a “technical knowledge that prevents them from becoming emotionally involved” [37, p 289]. The spectator was secretly hoping that it was indeed magic, at least on some level. There are indeed other levels on which the show can be appreciated: technical proficiency of the performer, the presentation and stories which surrounded the tricks, and the method itself are all aspects of the performance which can be judged. Arnold Haskell feels similarly to Wonder, about ballet: “It is not necessary for the spectator to know the technique of dancing in order to enjoy or to understand ballet. It can be a positive

disadvantage to name each step and thereby lose sight of the poetry” [30, 239].

The spectator’s hope that it is real magic aids the magician invaluable. Though he may be actively trying to figure out the secrets behind the magic with one part of his brain, another part is hoping that there is no secret. This part of the brain is keeping track of all the positive evidence that something miraculous occurred, and conveniently discarding or not noticing all of the negative evidence.

Magicians, ironically, experience this secret hope perhaps even more than spectators. As Darwin Ortiz notes, “No magician would ever admit even to himself that he is searching for an effect that happens by real magic. But his behavior betrays him” [24, 22]. His behavior is the fact that he continues to buy new magic tricks which tout newer, better methods than the old tricks he already knows how to do. Once purchased, these tricks, and their secrets, join the old ones on his ever-increasingly burdened shelves, never to be performed. Secretly the magician was disappointed to find out that it was merely a secret magnet and a bit of tape that made the whole trick fly.

## Chapter 4

# Method

### *“To Throw a Card”*

“Nothing produces a more marked impression of a conjuror’s dexterity than to see so light and airy an object as a card shot from the hand with the speed of an arrow, and impelled into the most distant corners of a spacious hall.”

“The performance of his sleight depends upon a certain knack, by no means easy to explain in words. The student will sometimes seek long and vainly to acquire it, and when at last it is acquired, will feel quite surprised that so small a matter should have given him so much trouble. We will endeavor, at any rate, to describe the necessary movement.”

Robert-Houdin, *The Secrets of Conjuring*, 1878 [29]

To understand the experiment, you must first understand exactly what the goal of this exploration was. It turns out there were several goals, each with different questions attached to them. These goals ranged from very basic demographic gathering to the development of tools for creating better magic for magicians and teachers.

The first goal was to understand how to create better magic. This included questions about presentation style and teaching philosophy designed to help give magicians (and educators)

some insights into how to design better, more effective magic, and also, how to control whether the magic incites curiosity or not.

Goal number two was to begin to understand what wonder's effects on spectators are. Does wonder affect curiosity? Does it make people more generous? How does it color our overall experience of every day events?

The third, emergent goal, was to create a general use tool for magicians to allow them to analyze their own presentations and effectiveness. The experimental system, an online movie viewing and rating system, allows for the field testing of different styles of presentation. Not only does the system allow a magician to review how well each of his tricks was rated in varying styles, but it also allows detailed study of the audience's reactions captured via video.

All of these goals coalesce around the emotion of wonder, and the family of emotions that enshrine it. The questions are looking at the universality of the experience, how it is manifested, methods of eliciting it, and its effects on people. The end result should be the discovery of a few stepping stones, from which to embark on future exploration of the deep water that is wonder.

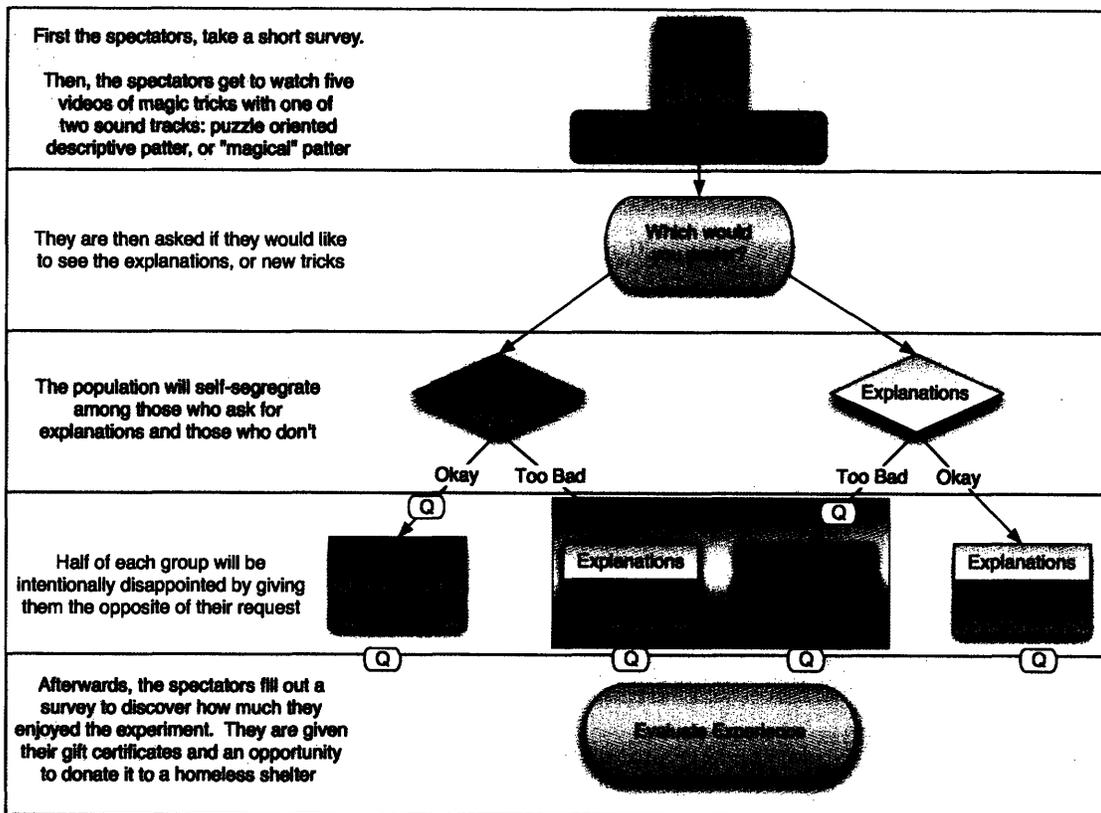
## 4.1 Experimental Design

The design of this experiment, though relatively simple, allows for the analysis of many different variables. It was essentially several experiments combined into one to allow for different conclusions to be drawn along orthogonal hypotheses.

In each case, a spectator is first allowed to watch some videos of magic. They are then asked if they would prefer to see the explanations of those tricks or be shown some more magic tricks. Then they are asked a few questions about the whole experience.

From the point of view of a spectator, it appears to be a simple video watching and rating interface. First there is a survey asking some simple questions including name, age, and a

Figure 4-1: Wonder Experiment Flow Diagram



few questions about general interest in magic. Then the subject watches two sets of videos, each consisting of five short videos of magic tricks, cropped mostly around the hands.

After watching the first set of videos, the subject is asked to rate each of them as to how much they liked it. They are then asked whether or not they would like see the explanation of those tricks. Some subjects are then shown explanations, while the others watch new magic tricks. There is then a post-survey asking about the entire experience. The subjects are then given their payment. The large diagram below outlines this procedure.

While watching the videos, their face is being recorded by a camera centered above the laptop screen. At the end of the experiment, they have the option to sign up for more magic tricks delivered via e-mail. After receiving payment, they are given the option to donate their proceeds to a local homeless shelter anonymously.

The entire experiment takes about 30 minutes for a spectator to complete. The experimental setup was portable, designed to be used in public and semi-public locations. It was conducted in the lab, as well as in cafes and other public settings such as parks, and is capable of being conducted remotely over the Internet. In our experiment, subjects were given a five dollar gift certificate and a dollar bill for their participation. When it was conducted in an ice cream parlor or coffee shop, the gift certificate was for the hosting establishment. In the lab, participants were given a choice of several different gift certificates.

## 4.2 Variables

The subjects are randomly assigned to one of several groups which determines the exact experience they receive. There are three variables that are changed independently. This results in a total of two to the third, (8) different conditions. If each condition were being compared to each other condition, the sample size would need to be very large. However, for most of the questions addressed, only two conditions will be compared at a time.

The first variable is which set of audio the subject heard along with the videos. Each video had two different scripts that were dubbed over replacing the original soundtrack. The

Figure 4-2: Where each of the measurements was made

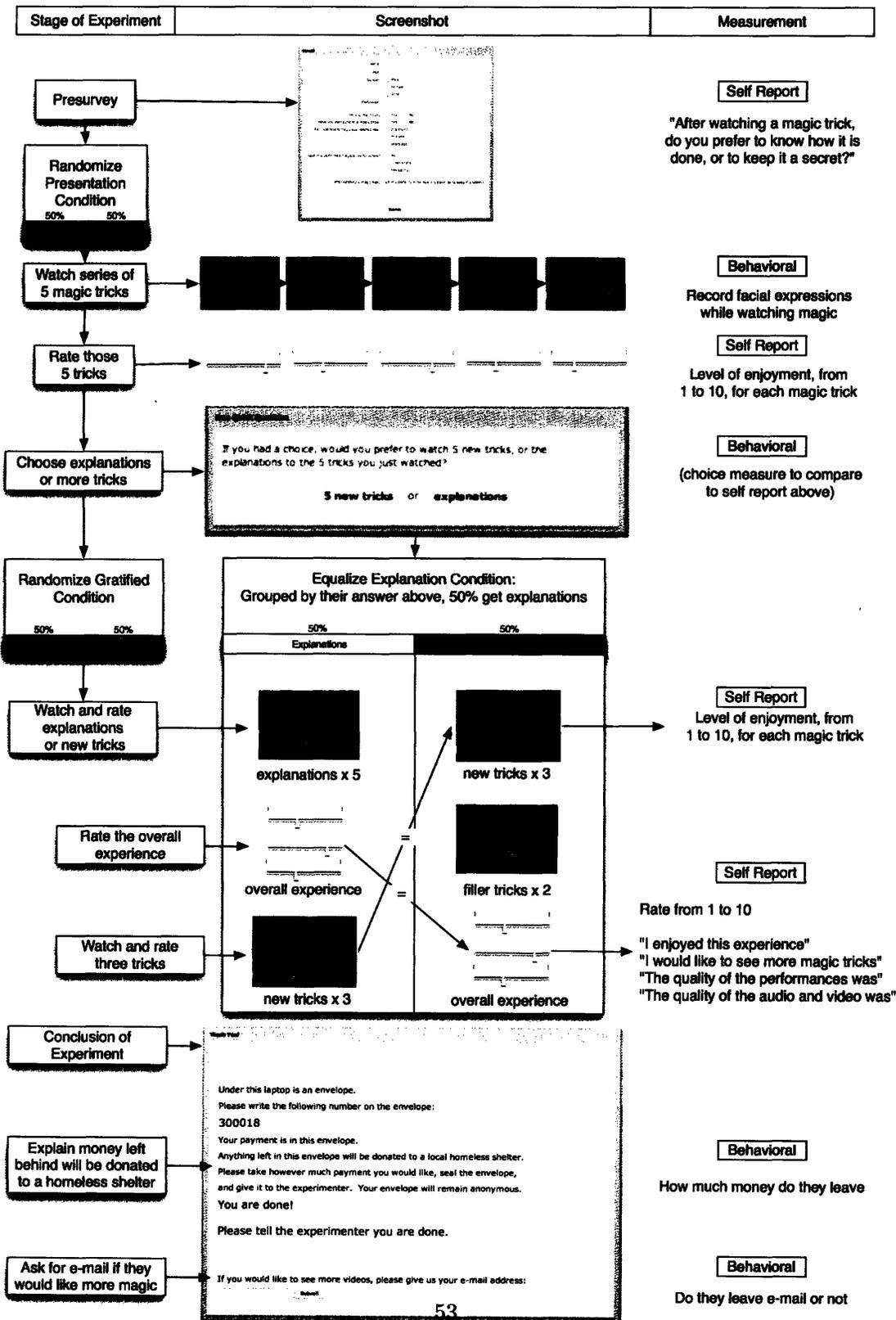


Figure 4-3: The film was cropped to show only hands and torso (left) while the spectator was recorded (right)



second variable is whether the spectator was shown the explanations of the first videos or not. Half of the spectators were shown short videos demonstrating the secrets of the first set, while the other half were shown new tricks. The third variable was whether or not they were granted their choice of whether or not to watch the explanations. Everyone was asked if they would prefer to watch explanations or new tricks. Half of these subjects were given their preference, while the other half were shown the opposite of what they requested.

The presentation and explanation variables are the most important for testing my hypotheses. The variable as to whether or not the subject received their choice was made mainly to counterbalance the negative effect of having your answer to a question ignored (though other steps were also taken to mitigate this effect).

#### 4.2.1 Presentational Variance

Among the rhetoric being passed down by master magicians these days, there is a large emphasis on presentation. To the novice or uninitiated, it seems that the most important aspect of a magic trick is its secret. The real secret, however, is that there is so much more going on in order to have a successful, entertaining, and wonder-filled magic trick. Some of these factors include misdirection, character, blocking, and . . . presentation. Eugene Burger,

Darwin Ortiz, Jeff McBride, and countless other magicians have extolled the virtues and indeed the fundamental importance of having strong, meaningful presentations. Their beliefs and opinions are founded on collective centuries of performance, audience observation, but no careful controlled experiments.

A number of people have attempted to quantify the roles presentation and other aspects of performance play in the reception of magic. While one small study cannot hope to either validate or invalidate generations of wisdom, it may confirm conventional beliefs while illuminating subtleties in the role presentation plays.

To test the impact different presentations have on the appreciation of magic, I wanted a controlled set up. This required performing the same magic trick several times with different presentations. Due to the difficulty of performing the same trick in exactly the same way over and over, live performances seemed less likely to maintain a maximum amount of control over the environment. The solution to this was to record videos of magic being performed, without showing the face or mouth of the performer. Then, in post production, new presentations could be recorded and played along with the video. In this way, the same trick could be shown with several different presentations.

Deciding how to vary the presentation was a very important decision. There are many theories on how to improve your performance through presentation. They have different, and occasionally contradictory advice. The two categories of presentation I chose to use in the experiment are labeled the “story” condition, and the “puzzle” condition. For complete transcripts of the different versions, please see Appendix B.

In the story condition, the magic tricks are accompanied by patter (a script) that attempts to demonstrate the element of good narrative. It uses metaphors to relate the events occurring in the trick to larger themes, and it uses colorful language to describe the events happening.

In the puzzle condition, the events are described very matter-of-factly. The patter merely describes exactly what is happening. There is little inflection in the voice. The goal of the patter is to help illuminate what is going on, but not to build any emotional relationship

with either the performer, or with the actions happening in the effect.

In the original version of the experiment, there was also a silent condition. The goal of the silent condition was to provide a control from which to compare the other presentation styles. However, in the pilot study, the results from the silent condition were abysmal. The subjects watching the silent versions universally were disappointed with the experience, and all of them stopped half way through. This does not imply that all silent presentations are awful, however the format of watching medium quality videos on a computer monitor for half an hour seems to require some more explanation of what is happening.

#### **4.2.2 Explanations**

Magicians never reveal the secrets. Almost never. There is nearly universal agreement that revealing the explanations is detrimental to the magic. How accurate is this belief? Half of the subjects in this experiment were forced to watch the explanations, and half were not allowed to. The goal was to discover what the effect of knowing one aspect of how the magic trick is done (the secret), is on the appreciation of the whole trick.

The other aspect of this question is whether or not someone wanted to see the explanation. Not everybody likes to know how an effect is done, and indeed the first part of the experiment attempts to affect how many spectators want to know how by varying the presentation. Therefore, the effect of receiving an explanation should vary depending on whether it is against your will or not. For this reason, each subject pool was counterbalanced. Half of the people who wanted explanations were not given them, and half of the group who did not want them were forced to watch them, the rest were gratified.

Explanations ruin suspense. Darwin Ortiz notes that magicians, when they purchase a new magic trick from a dealer, are always secretly hoping that the trick is really done by true magic. I hold that the same is true for spectators of magic. When they ask how it is done, there is some part of them that is hoping that it is really done by magic. Though they may cognitively and consciously know it cannot be real magic, the seed of doubt is an incredibly powerful multiplier of the emotion of wonder.

Not knowing something creates a hook that attracts attention and memory. It creates an allure. The super-bowl is an example of this. Viewers do not know which team will win. While some people do indeed enjoy watching the intricacies of the game, for most, the tension is not knowing who will win; will the underdog be able to triumph and make it back to be on top? The result of this is that most people do not go back and watch the super-bowl if they missed it. The only question most people ask is... Who won? The same thing happens with American Idol. Some people who miss the season finale, are not interested in watching it as soon as they know who the winner will be.

When a spectator learns the explanations to some tricks, does it take away the seed of possibility that it might be real magic. This is why the explanation group got three extra videos. After watching the explanations of the first five tricks, this group was given the three new tricks to compare to those who did not get explanations. It is designed to give us more data on the effect watching explanations has on new tricks.

The two groups have an equal total amount of time over the whole experience. In the measurement of a person's willingness to take time to donate to a charity, it is important for both groups to have been involved in the same amount of time. The explanations group does get 13 videos, compared to the trick group's 10 but the time is constant.

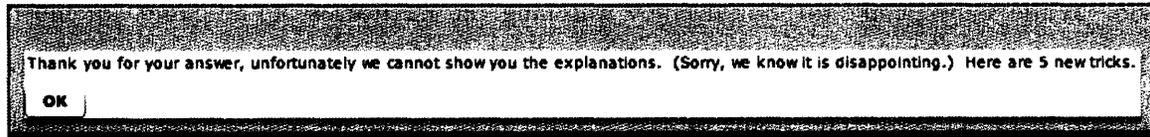
### **4.2.3 Confounded vs Gratified**

Half of the subjects were given their choice with regard to explanations and secrets. This was to balance feelings of disappointment and gratification, and to discover if people's actual enjoyment correlated with their stated desire. To counter the negative aspect of having your response actively disregarded, they were given a message of apology:

"Thanks for your answer. Unfortunately we cannot show you the [explanations or tricks] (sorry we know it is disappointing). Here are [5 new tricks or the explanations]."

This should neutralize the negative feelings, and indeed there was not a large negative reaction to not getting your choice as measured by subjects' overall experience at the end of the experiment.

Figure 4-4: Message displayed to those who were not given their choice of explanations



### 4.3 Who

The participants in this study were selected largely in the field. The locations included cafes, parks, and ice cream parlors. In order to answer some of the demographics questions a variety of ages was desired, as well as a varying economic cross section. Ice cream shops of different price ranges were selected including Dunkin' Donuts and Toscanini's. Kids at a summer camp were solicited to partake in order to get an idea of the effects of wonder over age. The camp had a sliding scale so the children were from a diverse family background.

A number of steps were enacted in order to get a better random sampling of the population. Because of their technical inclination, the MIT community was not solicited for this experiment. It is likely that geographical and cultural differences would affect the biases of the subjects. This exploration is left for future investigation, so only participants from the New England area are included. It would have been possible to solicit a large number of participants by advertising on the Internet. The fear that this would self-select a large group of technologically inclined people with access to the Internet as the subject pool kept this option from being taken.

Even with all the attempts to attain a random sampling, it is impossible to generalize entire populations based on small samples. The people who can afford to spontaneously spend 30 minutes in the middle of the day participating in a research experiment are a particular kind of person. . . this may affect the results. Then again, the kind of person who responds to an ad in a paper for a research experiment is a different particular kind of person. In fact, the people eating at an ice cream parlor may be the most likely to hire a magician or seek out magic performed on the street.

After being selected, the spectators are given a survey designed to help cluster the participants. Aside from the general questions like age, and profession, there are questions which are designed to establish the subject's familiarity to magic, and their feelings about explanations. These allow the clustering of the results around those who have much exposure to magic, and pre-existing beliefs about it. It also allows the discounting of people who are magicians.

#### 4.4 Measurements and analysis

It seems that measuring things is all the rage in science these days. So, it would seem apropos to include some measurements in my experiment. And so I have. I am measuring direct self-report data, several behavioral measures, and also measuring indirect effects through evaluation questions. Those are the quantitative measurements. The qualitative measurements arise from the video recordings being made of the spectator's facial expressions.

Each video clip has a self-report interest level. In the original pilot, subjects rated each video immediately after watching it. This model had the problem that, when rating the first videos, there was no sense of scale, so if you rated it very positively, you had nowhere to go if you liked the following videos better. By rating a set of five videos at once, the user can rate them relative to each other, giving the dynamic range more meaning.

The self-reported interest level plays a number of different roles. First it allows the comparison of the different presentations. This is a direct comparison of the scores of the puzzle condition to the story condition to see if one has a significantly higher rating than the other.

Secondly, it creates the ability to compare enjoyment rate to a request for the explanations. It could be that those who enjoy themselves more will be less likely to ask for the explanations.

Lastly, by comparing certain groups' responses, the effect explanations have on overall enjoyment may be measured. As three of the tricks are presented to half of the subjects

Figure 4-5: Pre-experiment survey

**Survey**

Name: \_\_\_\_\_

Age: \_\_\_\_\_

Gender:  Male  
 Female  
 Other

Profession: \_\_\_\_\_

Do you like magic:  Yes  No

Have you ever gone to a magic show:  Yes  No

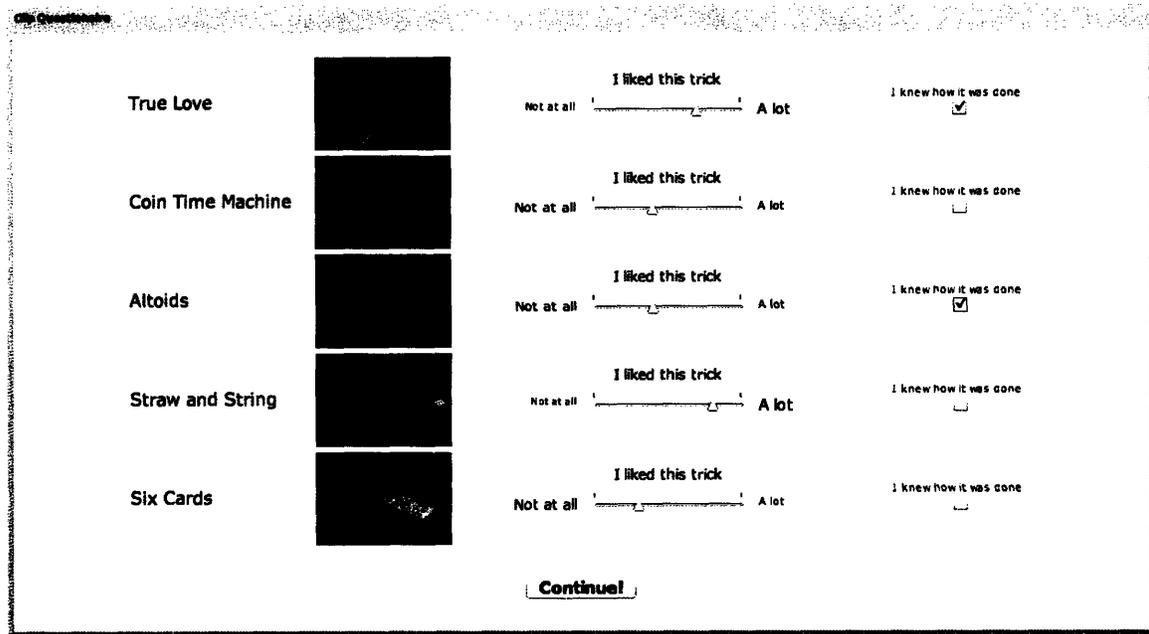
The most recent magic you watched was:  this month  
 this year  
 years ago

Have you performed magic tricks for others?  No  
 Occasionally  
 Frequently

After watching a magic trick, do you prefer to know how it is done, or to keep it a secret?

**Submit**

Figure 4-6: Screenshot of rating interface



after seeing explanations for other effects, their ratings may be compared to the control group, which saw no explanations.

There are several behavioral measures designed to measure the effect magic and wonder have on people. The first measure is whether or not they choose to watch the explanations. This may be affected by their presentational condition. The most interesting sample will be those that self-report that they either like the explanations, or do not like the explanations, but choose the opposite. Another behavioral measure is whether or not the subject requests more magic. At the end of the experiment there is a place to record your e-mail address, if you would like to watch more magic. With the amount of junk e-mail so high, choosing to add your e-mail to another list in order to see more magic is a strong sign of sincere overall enjoyment.

The last behavioral measure is how much money the spectator chooses to donate to feed the hungry. At the conclusion of the experiment, the spectator finds an envelope under the laptop. The envelope includes the gift certificate they were informed about, as well as an extra

Figure 4-7: The final screen of the experiment

**Thank You!**

**Under this laptop is an envelope.**  
**Please write the following number on the envelope:**  
**300018**

**Your payment is in this envelope.**  
**Anything left in this envelope will be donated to a local homeless shelter.**  
**Please take however much payment you would like, seal the envelope,**  
**and give it to the experimenter. Your envelope will remain anonymous.**

**You are done!**

**Please tell the experimenter you are done.**

**If you would like to see more videos, please give us your e-mail address:**  
\_\_\_\_\_

dollar. They are informed that anything they leave inside the envelope will be donated to a homeless shelter. The envelope is to be sealed and returned to the experimenter regardless as to whether or not anything is left in it. This way the donations become anonymous. The amount left in the envelope is later correlated to their condition to determine if certain conditions inspire generosity in the spectators. The null response is to leave nothing in the envelope. Some people leave the dollar and take the gift certificate. Some people leave the coupon behind, and a subject could even have added money to the envelope.



## Chapter 5

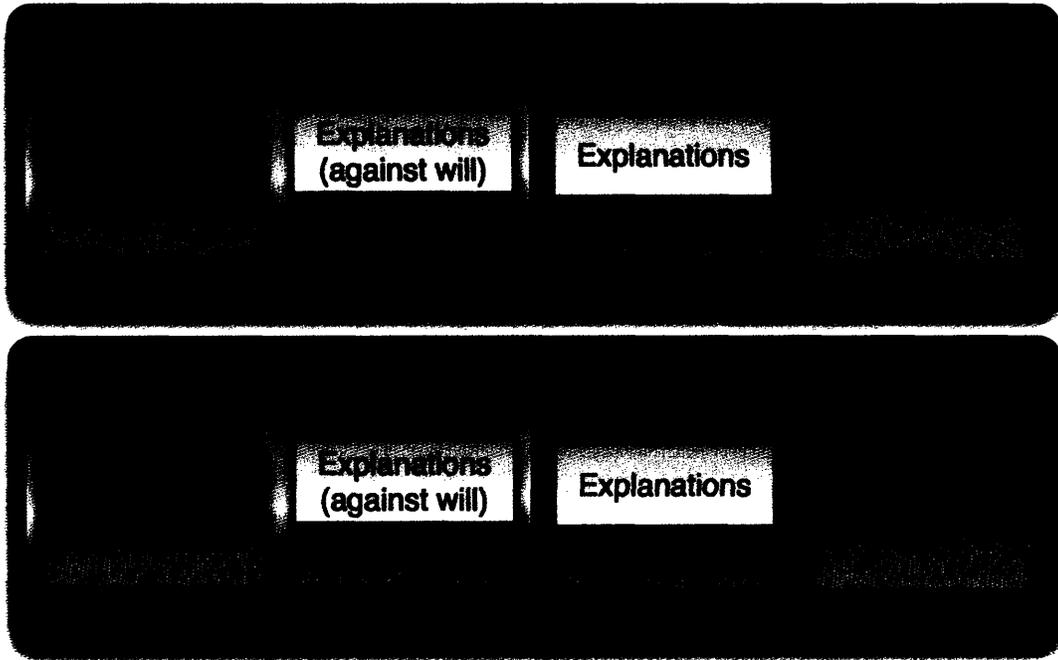
# Explanation

### 5.1 Subjects

Over the course of this experiment, fifty-eight adults and twelve children went through the procedure. The results were collected and are analyzed below. Of the 72 participants who took the experiment, one adult and one child's results were excluded because of technical difficulties. The adults were solicited at several locations in Massachusetts, and the majority of the children took the experiment at a summer camp also in Massachusetts. Seventeen adults were contacted in Northampton, MA in a coffee shop, 12 adult subjects took the experiment at public gatherings, such as the large outdoor gathering in Boston for July 4th. Most of the subjects had their facial expressions recorded during the experiment.

The population was randomly, and blindly, divided into one of eight global conditions. Each of the eight conditions is identified by three binary conditions: which presentation they watched, whether they were shown explanations to the magic tricks, and whether they were they given their choice with regard to the explanations. The population was also naturally segregated along self-reported gender, and age lines. These two questions were optional, so not every subject is included in that analysis. Children were classified as those under 18; everyone else was considered an adult. Three subjects chose not to continue the

Figure 5-1: The eight conditions subjects can be in



experiment after the first half, another two could not finish due to technical difficulties. The population breakdown by these binary conditions is shown below.

All of the results here must be qualified by the demographics of the subjects. A majority of the population sampled was solicited in Cambridge, MA. While an effort was made to avoid soliciting MIT students in the study, the primary sample pool was solicited in an area where a much of the population which has a relationship to an institute of higher education. It is likely that many subjects were either students or otherwise related to a college or university. Also, the subjects were mostly solicited in a locally owned ice-cream shop and coffee house. The children surveyed were predominantly children of this demographic, although their socioeconomic spread was greater. The demographics at this venue are not low on a socioeconomic scale. The results of this experiment are valid among this population, and certain results are more generalizable as discussed below. Other results, however, may be related to the particular population sampled. I have noted where I believe

Figure 5-2: The number of subjects in each population

	Adults (58)	Children (12)
Explanations	27	3
Gratified	28	4

this may be the case.

The format for reporting results is as follows: (N1, N2, p=X). N1, and N2 are the number of items in the two conditions being compared. In some cases these numbers are less than the total number of people, for example not everyone answered the question about gender. X is the probability that the measured difference between the groups is due to random chance based on a two tailed t-test (unless otherwise noted). A lower p means it is a stronger result. For the hypothesis questions, probability less than 0.05 is statistically significant, using a one tailed t-test. For other observed differences, the probability must be smaller to be considered significant. The more items being compared, the more likely a trend will appear due to chance. Because there I am comparing three different ways of looking at the data, a p-value less than .0167 (0.05 divided by three) is required for statistical significance using a two-tailed t test. In some cases, trends are noted that are not statistically significant given the small size of the samples, or the wide deviation of the results. These may be true trends in the data and merit further study.

## 5.2 Results

The hypotheses I set out to investigate at the beginning of the experiment focus on a number of pairwise comparisons between conditions.

*Presentation Hypothesis:* Storied presentations will have a more positive effect on spectators than puzzle-centered presentations evidenced not only by enjoyment, but also behavioral measures such as greater willingness to donate to others

*Explanation Hypothesis:* Learning the explanations to tricks will have a negative impact on spectator's enjoyment of the magic

*Dissatisfaction Hypothesis:* While everyone will be negatively affected by not getting their choice with regard to explanations, those who get explanations against their will will be more disappointed than those who get more tricks against their will.

The conditions are depicted in the diagram below. The population that received stories was broken into those who got what they asked for with regard to explanations (the gratified condition) and those who did not (the dissatisfied condition). Each of those groups is further broken into those who viewed explanations and those who did not. These comprise the eight different conditions.

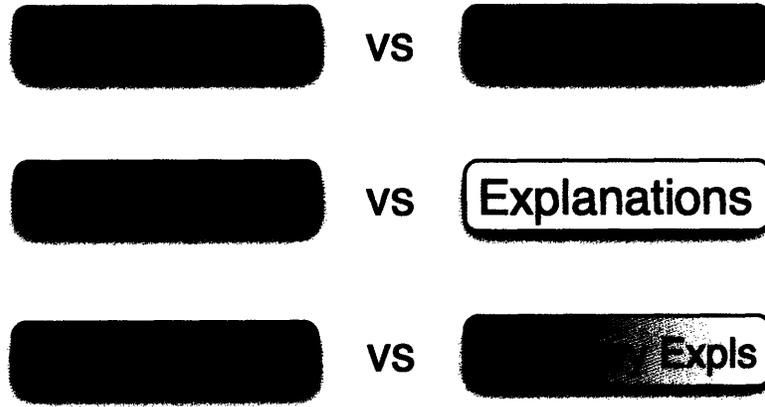
My hypotheses predicted various differences in the responses of subjects. Below, in detail, are described each of my predictions, along with whether or not the data support my hypothesis. Originally I identified the following groups as likely to be different: story vs puzzle presentation, those who watch explanations vs those who don't, those who were shown explanations vs those shown more tricks, and the ratings of each individual before and after watching explanations.

The various measurements being compared are:

### **Video ratings**

- the ratings of individual tricks,

Figure 5-3: The conditions for which I had hypotheses



- the combined ratings of all the tricks,
- the ratings of the tricks viewed after the explanations

**Post-survey questions (see Figure 5-4):**

- "I enjoyed this experience"
- "I would like to see more magic tricks"
- "The quality of the performances was"
- "The quality of the audio and video was"

**Behavioral measures**

- Facial expressions while watching videos.
- Do they choose see more tricks or explanations?
- Do they donate a dollar, the coupon, or both at the end of the experiment?
- Do they leave their e-mail to see more magic tricks?

Figure 5-4: Post-experiment survey

**Final Questions!**

**I enjoyed this experience**

Not at all | \_\_\_\_\_ | A lot

**I would like to see more magic tricks**

Not at all | \_\_\_\_\_ | A lot

**The quality of the performances was**

Terrible | \_\_\_\_\_ | Great

**The quality of the audio and video was**

Terrible | \_\_\_\_\_ | Great

**Continue!**

### 5.2.1 Story vs Puzzle

The expectation was that the people who watched the story version would like the magic more than the puzzle version. This is based on countless magician's advice that presentation is of utmost importance in the performance of magic. To test this both groups were shown identical video, but with different audio. The difference between these two groups was the patten, or presentation that accompanied the videos. The puzzle group had a sound track which talked about sleight of hand, the difficulty of the tricks, and how they were like puzzles. The story group had a sound track that talked about larger themes, like true love, or how to overcome big challenges in everyday life.

Each group watched the exact same video, the only difference being the words that were spoken. The face was not seen, and both groups had been re-dubbed with a new soundtrack. The pilot group was not able to detect that the videos had been re-dubbed.

Overall among adults, there was no reported difference between individual enjoyment of tricks based on presentation style.

However, when looking at only the 30 spectators who chose not to see the explanations, the presentation made a big difference. The storied presentation was enjoyed much more on average than the puzzle presentation for all the videos (12, 18,  $p = 0.002634$ , 1-tail). This supported the hypothesis that good stories make magic more enjoyable. The caveat is that it makes it more enjoyable to the percentage of the population that already prefers new tricks over explanations. Their overall enjoyment (a composite measure consisting of the sum of the first three questions in the post-survey) indicated that the storied presentation was much more enjoyed ( $p < .0005$ , 1-tail).

With regard to individual tricks there was no predominant trend. In some cases more people liked the story version, in other cases they preferred the puzzle version. This is contrary to the hypothesis that the storied version would be more enjoyed in every case.

Importantly, within the whole adult population, neither group was more likely to enjoy the entire experience, or to want more magic tricks than the other group. The quality of

Figure 5-5: There was no significant difference between story and puzzle among all adults

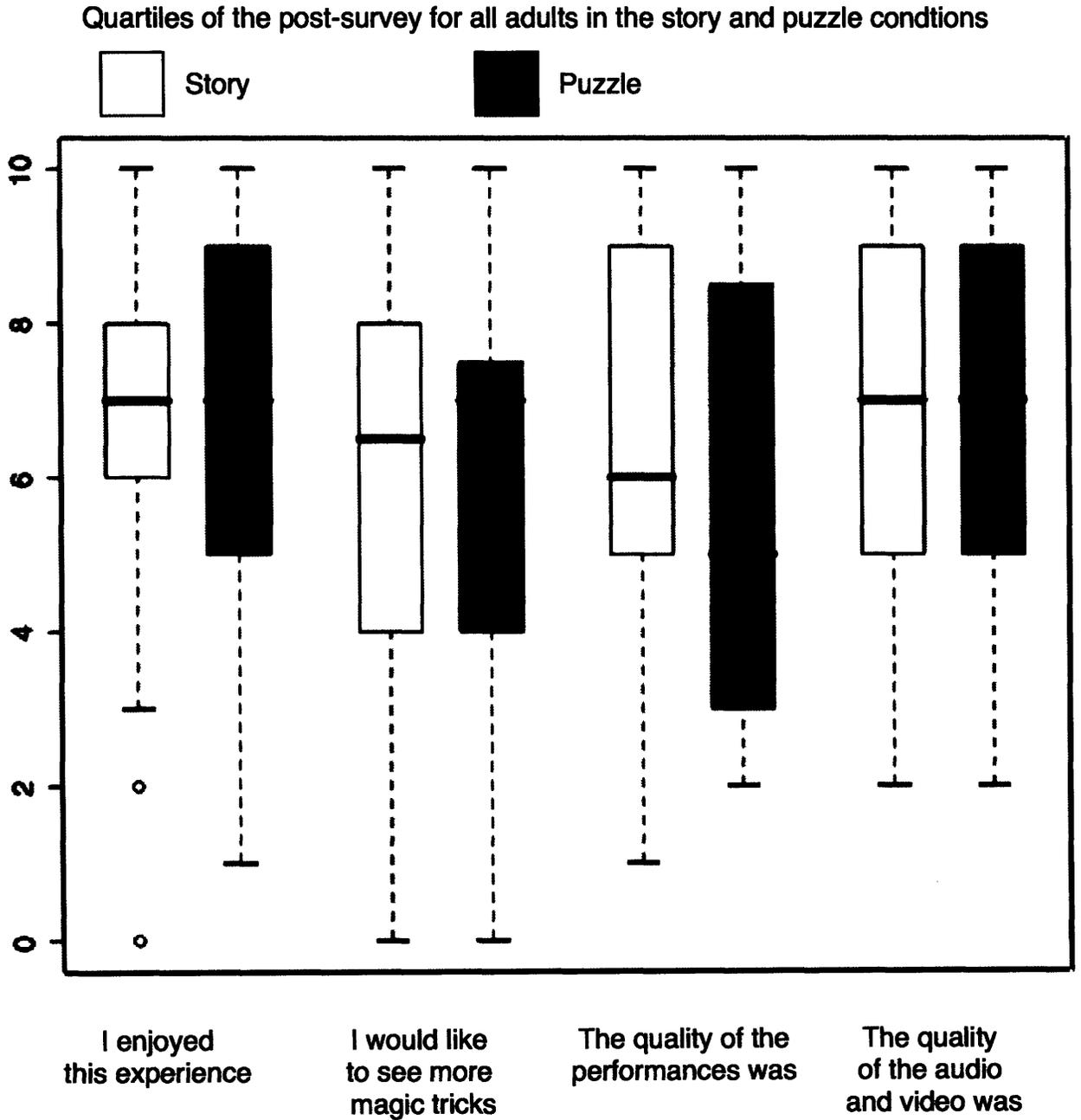
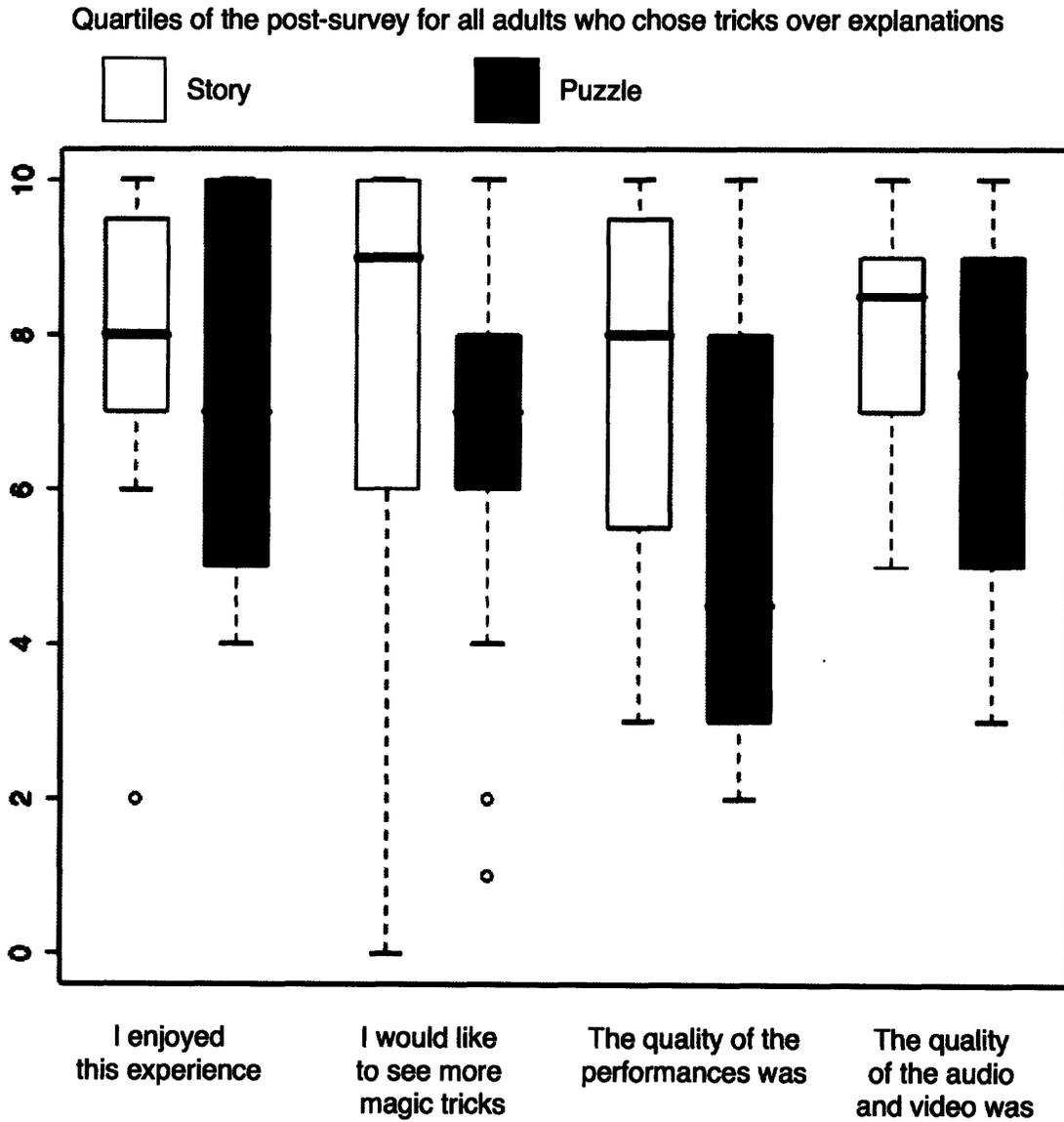


Figure 5-6: The story presentation scored better with those who chose not to see explanations



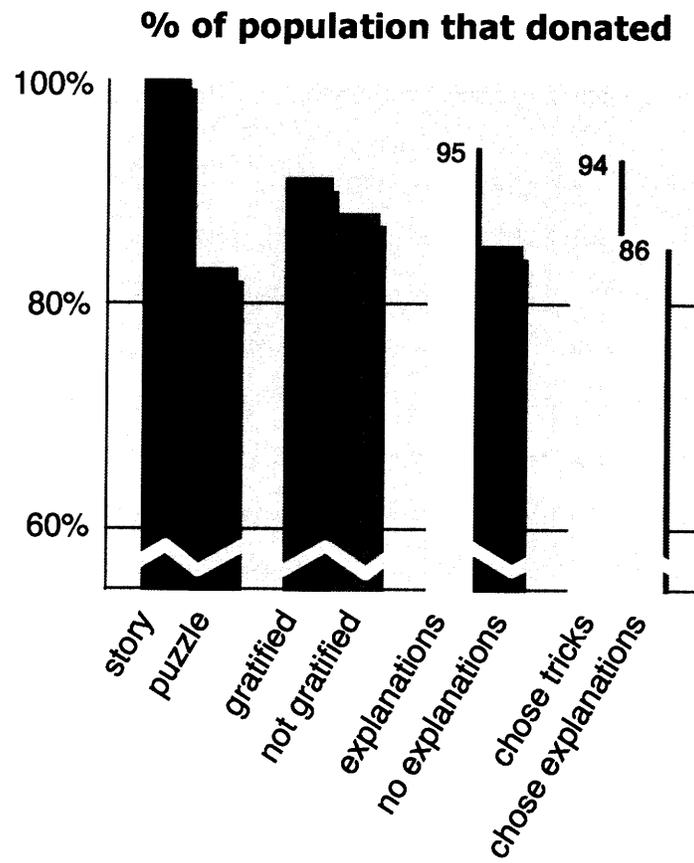
the performances and the audio and video were all rated approximately the same. Though there was a slight difference in means among adults who watched the story version to rate these higher in the story condition, it was not statistically significant ( $p = 0.53$ ).

This implies that the people who enjoy magic more are more likely to prefer more magic over learning the explanations. In addition, they are more likely to enjoy storied magic than magic presented as a puzzle.

There are a few more interesting differences between the story and puzzle groups. After the experiment, the subjects were given a \$5 gift certificate and a \$1 bill. They were then told that they could anonymously donate to a local homeless shelter any amount that they had left. My original hypothesis was that donation would increase with the story condition. Indeed this was the case. The story condition was the largest predictor of donation. The people who received the storied presentation were more likely to donate (24, 17,  $p = 0.021$ , 1-tail). This is very good news for magicians. It means that improving your presentation can help to make your community more generous. Not all participants completed the experiment and were therefore not given the opportunity to donate their gift certificate.

One other interesting effect, contrary to magicians' beliefs, involves the presentation's effect on the spectator's desire to know the secrets. Even before watching any magic, they are asked if they like to know the secrets of magic tricks. They then watch five magic tricks and are then offered a choice of explanations or more tricks. It turns out that when the magic is described more technically, as a puzzle and demonstration of sleight of hand, spectators are more likely to change their mind and choose *not* to see the explanations. This difference is not statistically significant, but I suspect with a larger sample the inclination would hold. Perhaps this is because when it is described as a puzzle, it minimizes the secret by openly acknowledging it, as opposed to pretending it does not exist. While it does seem to set up a contest between the performer and spectator, the performer has acknowledged this instead of allowing it to be a festering bug in the back of the spectator's mind. In a sense, answering the "whether" makes the "how" less important.

Figure 5-7: The story condition was the largest predictor of donation



### 5.2.2 Tricks Only vs Secrets Revealed

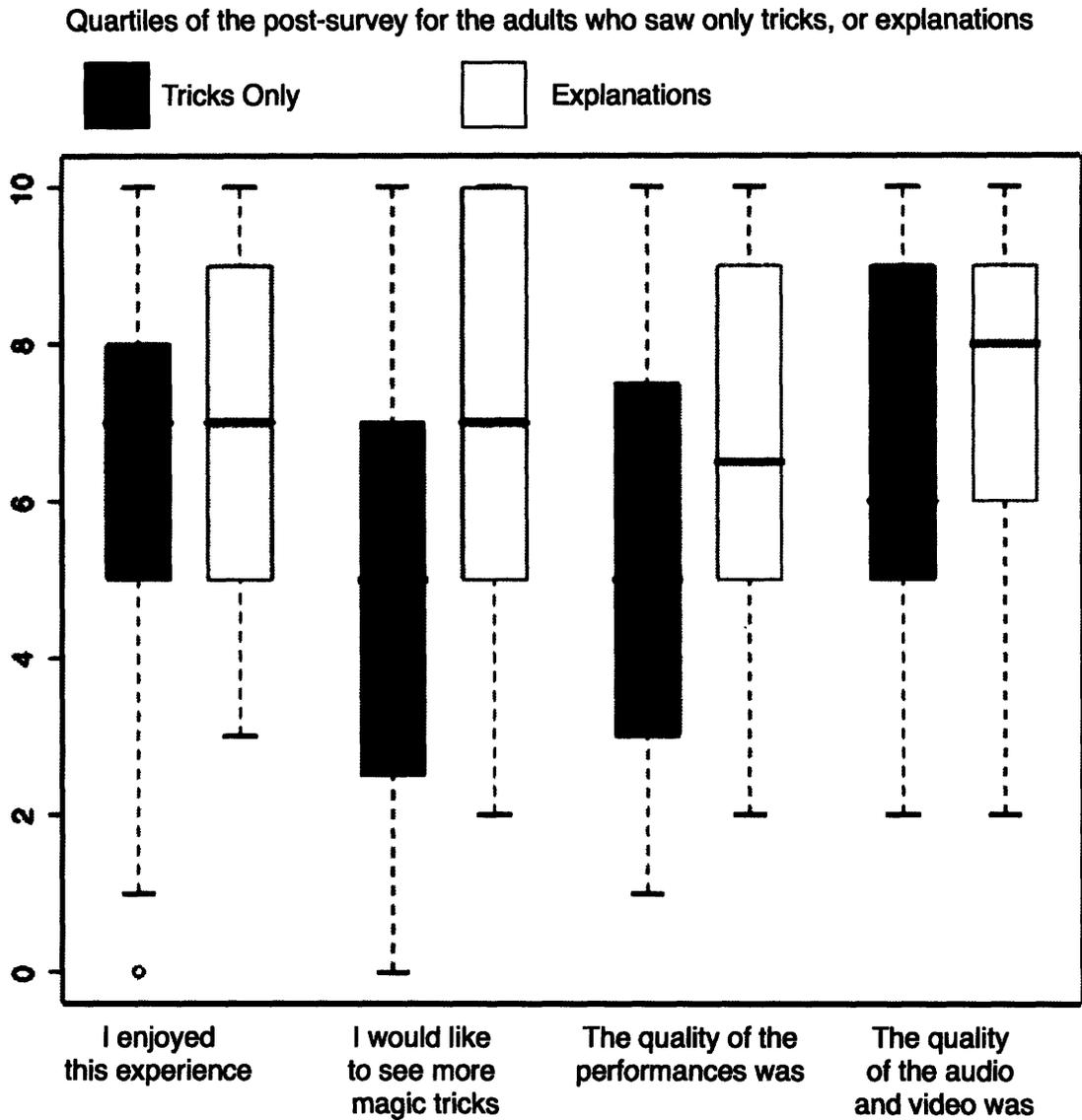
Magicians' number one rule in magic is "never reveal the secret". It may be time to reevaluate that belief. Of all the variables that affected how much people enjoyed the whole event, one stood out more than all the others. It was whether or not the secrets were revealed. And, magicians will be sad to find out, that the giving out of explanations was the secret to getting more enjoyment from the participants. They enjoyed the experience more (27, 28,  $p = 0.02$ ), they wanted to see more magic ( $p = .002$ ), and they thought the quality of the performance was better overall ( $p = 0.06$ ). Together these measurements speak to how spectators react to the secrets being revealed.

Watching explanations makes people appreciate more magic later. Everyone watched the first set of five videos (either story or puzzle), and then later watched the second set of three videos (again, in one of two flavors). Some people were shown the explanations for the first set, before watching the second set. The other group were shown two extraneous tricks at the end to control for the amount of time spent watching videos. Comparing the second set of videos' ratings between the group that had seen explanations to the ratings of the group that did not see explanations gives a hint as to how explanations may affect the perception of future magic tricks. Contrary to my expectations, watching the explanations led the spectators to report greater enjoyment of the final magic tricks even more than the control group ( $p=.04$ ).

The caveats are many, however. Such age-old wisdom as 'never tell how the trick is done' should not be tossed out easily, though such strong contrary evidence merits some reevaluation. The first caveat is that of the population sample. All of those sampled were from relatively affluent, and college centered areas. Most of the subjects were taken from the same town as MIT. Many of them were related to an academic institution in one way or another. This does not reflect the true demographics of most magic shows.

This measurement also only measures immediate reported enjoyment, not the overall appreciation of magic. It may be that the effect of learning the secrets on enjoyment is only short term. It is also interesting that this reported enjoyment did not have an affect on whether

Figure 5-8: Those who watched the explanations enjoyed the experience more



or not people donated (28, 30,  $p = 0.89$ ) unlike in the story condition, which increased the likelihood of donation. Spectators always express memories of their favorite magic tricks including phrases like “there was one of his tricks I never could figure out,” as Michael Ammar noticed when he began performing magic [1]. On the contrary, after watching “The Masked Magician” reveal the secrets to effects on television, I heard spectators say “I saw how you do that on TV, I don’t remember how to do it, but it was on TV.” So perhaps there is a memory effect that is inversely related to immediate enjoyment.

A third caveat is the long term effect of explanations. Magicians very rarely, if ever, reveal their secrets to their spectators. Thus, there may be an initial surprise and excitement at what is a rare treat. It could be the novelty of getting explanations eliciting the enjoyment. This may not be a sustainable level of excitement, so although after explanations they were more likely to want more magic tricks (self-report,  $p < 0.003$ ) the novelty might wear off with more explanations. David Copperfield wrote,

“There are things one gives up when one becomes a magician, like the experience of feeling the wonder yourself. That grabbing emotional sensation of amazement becomes a rare personal experience for a magician. . . sadly, the more familiar we are with creating wonder, the more rare it is to feel that sensation yourself” [1].

If this is true, then eventually the positive effect of explanations must wear off, or their novelty must dull.

However, according to the data, if a subject asked for explanations, and didn’t get them, they were disappointed and didn’t report wanting more tricks at the end, compared to those who wanted explanations and were gratified (16, 19,  $p = 0.013$ ). However, getting the explanations made people more likely to want more tricks. Therefore, if a spectator wants explanations, the magician might consider giving them the explanations. Maybe magicians are all wrong. Perhaps it is time for Nevil Maskelyne to take his own advice and start offering his secrets for anyone who is interested.

Though striking, this data set does not suggest that drastic a measure. The subset of people randomly selected to see the explanations liked magic overall more than their counterpart, even before watching the explanations. Even though they liked magic more to begin with, their enjoyment improved more than their counterparts after watching explanations. This strongly encourages magicians to investigate this central tenet, the primary dogma of magic, and discover if it is actually doing harm to the people it claims to be serving. It also counters the result found by D. Gilbert that “Uncertainty can preserve and prolong our happiness” [14, p 209]. Until the issue is more clearly understood, I am afraid, as a creature of habit myself, I will continue to side with Tommy Wonder.

“We must also remember that some people are conditioned, have it engraved in their mind, that when they see a magician they should try to determine how the tricks are done. The moment they know you are a magician, they throw themselves into the role of detective.” Tommy Wonder believes magicians should minimize the technical aspect of magic so that they may “enjoy the other aspects your magic has to offer” [37, p 36].

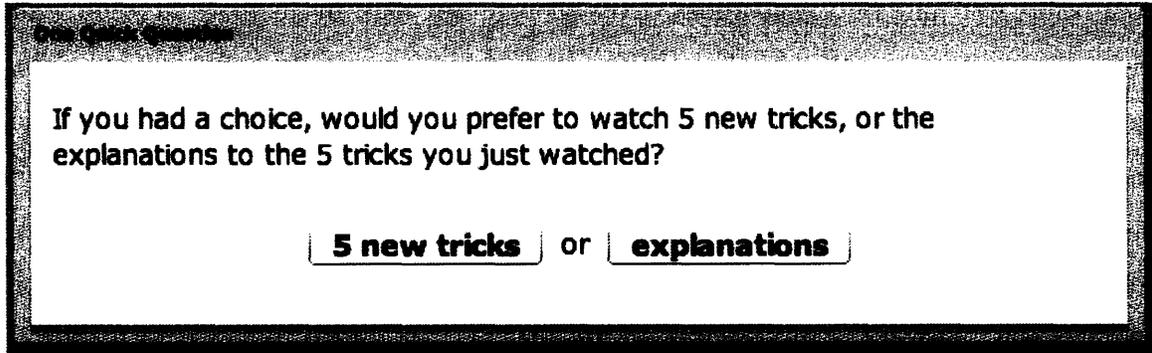
Those are the results that addressed my original hypotheses. In reviewing the data, a number of additional interesting trends were discovered. They are discussed in the next sections.

### **5.2.3 Male vs Female**

The difference between men and women is not very large, over all. They like individual tricks to different amounts, but there is no discernible trend. However, even though men and women both report similar enjoyment of the experience, men desired to see more magic tricks after the experiment more frequently than women (17, 16,  $p=.044$ ). They actually took the step of giving their e-mail to see more magic tricks more than women as well ( $p=.007$ ). These statistics are for all adults (though not all adults chose to answer the question about gender).

Approximately 60% of both males and females initially say they would like to know the explanations. In my study, males were more likely to change their minds in favor of not

Figure 5-9: Spectators are given a choice after watching the first five magic tricks.



seeing explanations, while females were more likely to change their mind and decide to see explanations. This is not statistically significant, but is consistent with the result above that men want more magic tricks.

Again, we have strikingly different statistics when we look at the data based on only those who did not choose explanations after watching the first five tricks. Within the population that did not choose explanations, females liked all of the tricks better (9, 6,  $p=.0006$ ). Even if we factor out the female bias, men still report greater enjoyment with the storied version of the tricks (4, 3,  $p = .009$ ). In fact it seems that men had a larger bias towards the stories than the females. It is very likely that overall, men enjoyed the storied version better (9, 8,  $p = 0.01$ ).

#### 5.2.4 Wanted Explanations vs Wanted More Tricks

One of the most interesting differences in population was between the group that asked for explanations, and the group that asked for more tricks. There were two opportunities for a spectator to express their preference. At the beginning, they were asked the question "After watching a magic trick, do you prefer to know how it is done, or to keep it a secret?". Then, after watching the first five tricks, they were asked: "If you had a choice, would you prefer to watch 5 new tricks, or the explanations to the 5 tricks you just watched?"

While 60% of the population claimed that they liked to know how magic tricks were done in the pre-survey, and 60% of the population actually chose to see the explanations when given a choice, it was not the same 60 percent. An equal number of people, 18%, changed their mind in either direction, some deciding to ask for explanations, and others deciding to ask for more tricks when they had claimed they liked knowing the explanations. This implies that more than half of the population knows their preference, and sticks to it. On the contrary, it also implies that if someone claims they don't like to know the secrets, there is a 50% chance that they will change their mind after watching magic tricks.

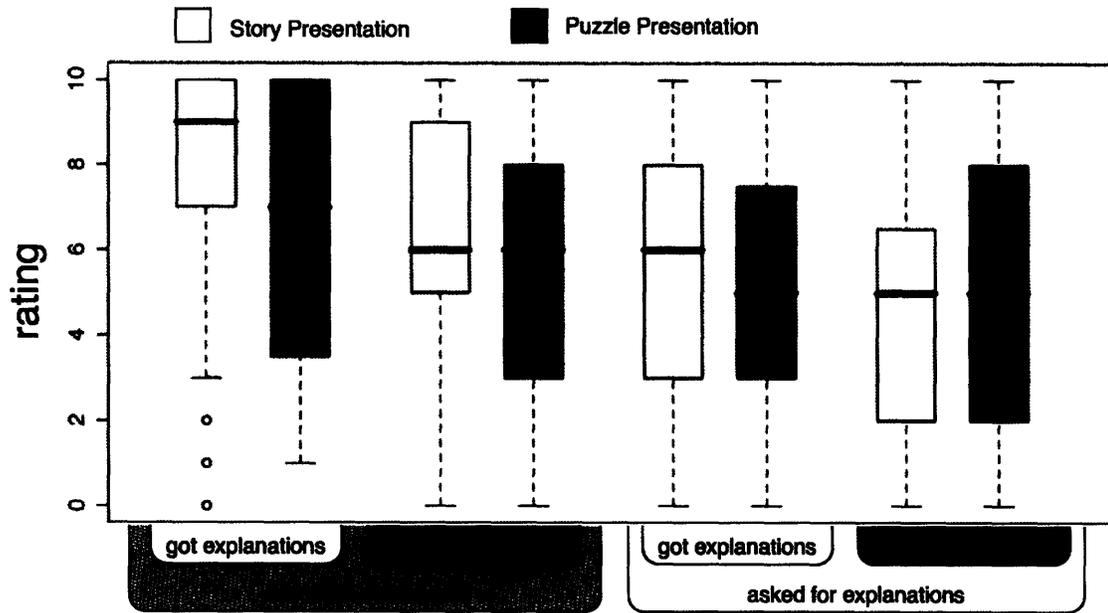
As mentioned earlier, which presentation the spectator watched affected their likelihood to change their mind in either direction. Those who watched the storied version were more likely to flip and ask for explanations, while those who watched the puzzle version changed their mind to choose to see more tricks.

Comparing the responses of those who wanted explanations and those who preferred tricks when given a choice, reveals a large difference. The ones who chose tricks over explanations rated all of the videos an average of 1 point higher than those who chose explanations (32, 23,  $p < 0.00012$ ). They were also more likely to want more tricks at the conclusion of the experiment (32, 33,  $p < 0.033$ ), and their overall reported enjoyment was greater (32, 33,  $p < 0.005$ ). This demonstrates that not wanting the explanations is correlated with higher reported enjoyment of magic. While the second result is not statistically significant for a post-hoc observed trend, the first and third results, with such low probabilities (0.00012 and 0.005) indicate that the overall trend is most likely not due to chance.

Interpreting these results is slightly tricky. It could imply that one measure of how well your magic is enjoyed is whether people want the explanations or not. Combined with the earlier result about explanation's effects an interesting suggestion arises. Magicians should seek to present their magic in such a way that people do not want to know the explanations, but they should not be quite so dogmatic in their resistance to offering the explanations.

If we look at the sub-population that claimed they did not like explanations at the beginning, there is another interesting trend. They preferred the story version of the magic tricks more

Figure 5-10: The average ratings of the tricks between populations, with quartiles



by almost 2 points (4, 8,  $p < 0.0008$ ) and they enjoyed it more by over two points (4, 8,  $p < 0.001$ ). This implies that even before watching magic, spectators have expectations, and that if they are the kind of person who does not think they like explanations, they will probably enjoy the story version more than a puzzle version of the tricks.

The overall conclusion here is that the more someone likes your magic, the less likely they are to want the explanations. Those who enjoy magic are more likely to prefer a storied presentation to a puzzle one (14, 9,  $p < 0.008$ ). On one hand, this is good news for magicians. It means that for the people that like magic, magicians are doing the right things by keeping their secrets and focusing on presentation. On the other hand it means that they are missing out on the other percentage of their audience which prefers knowing the secrets and is not as interested in storied presentations.

### 5.2.5 Along Age lines

The overwhelming result when looking at the data from children is fairly predictable. Kids report liking magic more than adults rate magic tricks higher by nearly three points (10, 55,  $p < 0.00000000000000001$ ). Surprisingly, their preference to know the secrets was not markedly different from adults, contrary to my expectations. It seems that kids are no more interested in learning the secrets than their adult counterparts.



## Chapter 6

# Afterthoughts

### 6.1 Reflections

In preparing this study, I talked with many people about magic tricks. Many of the people to whom I described the experiment insisted that there was a large flaw and that I would not get good results. They claimed that everybody would ask to see the explanations and nobody would want more tricks. Their belief was so insistent, that it began to affect my belief, contrary to my expectations based on passed performances. In the pilot study, I solicited some children from a local home-school group. Two kids tried it and the system froze, but not until both of them answered the question about wanting the explanations or not. Both of them wanted to see more tricks instead of explanations! This was the first hint that my questions might get interesting results. It also reinforced the notion that there is a huge difference in types of people. The people I had consulted from my peer group at MIT could not conceive that individuals might not want to know how it is done. This again reflects the fact that the population of this study is strongly colored by its relationship to higher education facilities and should be understood in context.

In pursuing the emotion of wonder so devoutly, I lost track of the other reasons I do magic. It is not just to create a feeling of amazement and a dumb stupor, it is also to transfer

this emotion over into other aspects of daily life. I strive to create a passion for life, for mysteries in general, and a connection with other people. As Sharpe put so eloquently,

“Wonder is the most divine of the human emotions, capable by degrees, and with repeated emphasis, of raising man’s feelings beyond the awareness of mundane things until he becomes wonder-full. Wonder and veneration feed the soul. So by emphasizing and stimulating the feeling of wonder, the magician seeks to develop in people the habit of looking at all things wonderously, and thus to see the world in a new light: the light of the soul and the spirit” [30, p. 184].

These, while tied to the emotion of wonder, are not directly tied to how much someone enjoys a magic trick. Thus, my failure to show that the “storied” presentations were more enjoyable to everyone is by no means a denouncement of storied presentations, as there are so many other aspects of a performance that are meaningful (or unmeaningful). I do not want to create tools for people to deliver mindless entertainment. (See Caution)

*Experimenter Effect:*

I was the subject of the videos and also the experimenter for a majority of the subjects. Another experimenter was hired to run 18 of the adult subjects. There was no statistical difference in the results based on who the experimenter was. This implies that there was not a huge impact from the fact that I appeared in the videos and administered the experiment. This was likely due to the cropping of the video such that my face was not visible during the magic.

*Video Effect:*

The largest problem with this study is that it uses videos of magic. There is a tremendous qualitative difference between watching videos of magic and watching magic performed live. Michael Ammar, while reflecting on which magic tricks people remembered more noted, “things they just witnessed, without EXPERIENCING, just didn’t become part of long

term memory” [1]. While the videos allowed for the comparison of presentations in a controlled environment, it ignored many other aspects of good performance like eye-contact and audience interaction. One of the big deficits with watching videos of magic is that it lacks any semblance of spontaneity. “The single most potent and generally most accessible technique for giving your performance a sense of spontaneity is to spontaneously interact with the audience” [23].

### *Nerves, Amplified*

The most difficult part of the study, for me, was watching people watch my magic. Normally, while performing magic, my nerves are relatively calm. I have the experience and the confidence to perform coolly. While conducting this study, my nervousness was increased not only by the newness, but by my complete inability to manage my first impression. It was important for me not to bias the subjects by interacting with them, but that meant leaving my entire reputation as a performer, and as an interesting person, to 10 first take recordings of me doing magic. Originally, some of them even had to sit through it silently, without my voice. They couldn’t see my facial expressions, some couldn’t hear my voice, I can’t imagine what would have happened if I had really had a sound track of me being a complete jerk. So, I sat while my subjects watched my performance, feeling judged, and tried to read a book.

### *On Secrets*

It is difficult to determine why someone may or may not want secrets. I have assumed that the main reason people would want to know the secret is that they did not enjoy the magic trick at a deep level. This seems to be supported by the results above in which those who did not want explanations enjoyed the magic more. However someone may want to know the secrets because they are a magician and really liked the trick enough to add it to their repertoire. Contrarily, they might not want to know the secrets because they would prefer work it out on their own. There is something enjoyable about being able to figure out a really good magic trick, better than having the explanation told to you. Perhaps watching the same videos again would be an interesting way to gain insight into this phenomenon.

### *Language*

One of my primary interests in this experiment was the effect of presentation on the reception of magic tricks. I only looked at changing the verbal aspects of presentation. The words were changed, and the tone of voice could not be held exactly constant, but still there were differences in effect. However these are not the only aspects of presentation. In fact presentations can completely forgo the use of language. When I tried showing the sample videos of magic tricks silently to subjects they could not stand it. The tricks had been performed originally with words and it was obvious from my pacing and body language. Had I performed the original tricks completely silently, hand gestures and body language would have been used to augment the narrative and the silent version would not have been so excruciating. For example, during my preliminary work in China, my magic went over very well. In this case I could not speak the language at all. There are also many examples of magicians performing completely silent acts. These many other aspects of performance, routining, suspense, and choreography among them, all have tremendous impact on the how magic is perceived.

### *Magical Improvement*

The system can be used to analyze and improve the performance of magic. The tool I have created to examine the impact of magic tricks is not only useful for general study. It also provides very real feedback on specific tricks. The results indicate which, of the included effects, are my strongest. It has also highlighted some weaknesses of presentation, and other subtle differences such as which tricks are overwhelmingly more popular with females. The generalization of this tool could allow magicians to objectively analyze their repertoire and hone in on areas of improvement. The ability to review the video footage of spectators watching magic synchronously should also provide insights into timing, lines, and misdirection. Of course the video experience is inherently limited. There can be no replacement for experience performing as a method of improving and creating stronger magic, “What would you prefer for yourself when going out for an evening: to feel that you have watched an interesting person, or that you have met an interesting person with whom you have had a good time?” [38, p. 12].

## 6.2 Future Work

The purpose of these experiments was to explore a variety of aspects of wonder. The intention was to illuminate the potential paths which lead to and from this infrequently studied emotion. It has raised more questions than answers and opened up many new topics for exploration. These questions tend to align around three polls: what elicits wonder?, how can wonder be measured?, and what effects does wonder have on humans?.

These questions include a whole array of potential research questions. Are humans prejudiced against technology for the production of wonder? Does a causal explanation necessarily remove sensation of wonder? Does the witnessing of others in wonder encourage the experience of wonder in the viewer? What environments encourage the wonderment?

Around the measurement of wonder are many technical and cultural questions. Can facial feature recognition software recognize expressions of wonder? How variant is the expression of wonder across generations, cultures, and environments?

What effect does wonder have on people? Does it contribute to a happier quality of life? Does it foster curiosity, creativity, or persistence? Does it aide in abilities to do certain tasks, inhibit others? Does it facilitate learning, or memory? Does it antagonize some people and pacify others? Does it play a role in religion?

Here are some of the more interesting questions which bear investigation:

*Why do we have wonder?*

What is its evolutionary basis, and role in society? Parris' brain research may provide some insight [[Subbotsky:1994]. There are still questions about its role in learning and curiosity.

*How does the medium affect wonder?*

Is magic as interesting when it is presented by a machine as when it is performed by a magician? Some magic tricks can be performed by computer programs, done over television, or phone. I am interested in how these different mediums affect the reception of a magic trick as compared with a real live magician.

### *Social Context and Wonder*

The social aspect of wonder could be explored. How does the social context affect the expression of wonder? Does the presence of a “plant” who is visibly and or audibly responding wondrously to an effect increase or decrease a subjects demonstration of wonder, or their enjoyment? There is anecdotal evidence from other studies that support the hypothesis that the ability to share the expression of an emotion with someone else who is experiencing it at the same time can augment its expression and perhaps its experience.

### *Synchronicity of reaction*

How quickly is the emotion of wonder expressed? This is related to Parris’ work of studying brain reactions in MRIs [[Subbotsky:1994]. There is an open question about how we register something as magic and what part of the brain is involved in the resolution of expectation violation. Measuring the variation in response time between subjects while watching magic may lead to some observations about how consistent and hardwired our wonder-response actually is.

### *Wonder through the ages*

How does the response to magic change? Though in my experiment I was able to make some general comparisons between children and adults, my samples were not large enough to spot larger trends. How do children go from liking magic a lot in their youth to liking it less as adults? As adults grow older, how does their interest in wonder change? These questions require a larger number of subjects at specific ages in order to see their implications.

### *How does wonder affect effort?*

One interesting question has to do with the effort required to learn something. In my experiment, the spectator had the option to click a button and see a video with the explanation of the trick. This is a relatively low cost, and a low amount of effort required to uncover the secrets. The amount of work How does differing amounts of effort affect retention... how much wonder leads to the right amount of effort?

### *Why do people like secrets?*

Why don't people want to know how it is done? Is it social pressure, or societal training, or is it truly a desire to maintain mystery.

*And more...*

The number of questions just keeps increasing. How does routining (the order of magic tricks) affect magic perception. I could easily test a preset routine versus random order. What do the demographics look like in a larger, more diverse sample? How do the results differ when performed live by a magician for his or her audience? What is it that makes some people like magic more? What is the root cause of making people more generous, as observed in my experiment? Does magic make people more generous than other forms of entertainment? How does wonder interact with memory? Are people who learn the explanations more or less likely to remember the event?

## 6.3 Caution

*Politicians and Psychics*

Never trust a magician. . . They get paid to lie to you. The experience of wonder is powerful and wonderful, but is not appropriate in all venues. It has the ability to impair the faculties of reason. Therefore, politics is not the place for wonder. What happens when we put magicians in power? The ability to manipulate people's emotions and beliefs is very powerful. There is an unwritten agreement to be fooled by a magician. Without this tacit agreement by both parties to be deceived and to entertain, it is swindling. Psychics walk dangerously close to this line. While many enjoy psychics as forms of entertainment and points of reflection on their life, frequently psychics abuse their power over people. There is no written or unwritten agreement between psychics and their paying victims. Frequently they use the exact same techniques that magicians do to elicit a state of wonder quite conducive to separating a rube from his money. When sleight of hand, misdirection, or deception is used to create wonder which disenfranchises the public, it is a disservice to the experience.

*Capitalism*

There is another aspect of wonder who's exploitation is more subtle. That is its role in capitalism. Everyone is familiar with snake oil peddlers; those unscrupulous showmen who sold bottles of concoctions which they claimed would cure every ailment, and solve every ill. These men were frequently also magicians performing shows of amazement to add credibility to their claims. People have a desire to experience wonder, and a desire to believe the wonders they witness. Thus it is easy to design products to exploit a sense of wonder in order to create an artificial need and artificially fill it. A recent product claimed to translate a dog's bark into English so that a caring pet owner could better communicate with their pet. The dubious scientific claims behind it are playing on a sense of wonder and the potentially miraculous to create a market. Magic has had a bad reputation historically from association with such endeavors: "This association of magic with nomadism, commercial deception, and begging was standard, as we recall, in ancient writers" [10, p. 78]. In fact, the first book of magic, *The Discoverie of Witchcraft* was aimed at defrocking those using wonder to deceive others.

When Technology imparts its associated sense of awe and wonder, it has the power to turn off the critical faculties. . . it can create a sense that something is beyond compare or criticism. This can blind adopters of technology to its faults, its hidden costs, and potentially create dangerous situations.

Brian Lam was reviewing the iPhone for the tech-review site, gizmodo.com. His overall opinion was that it was a good phone, but not quite ready for prime-time. His thoughtful criticism does not end with the cellphone, but also extends to the other reviewers who had been overwhelmingly positive, "I feel like they are under emphasizing the flaws in light of the shock and awe of the phone's Wonders." [20] It is Wonder's ability to "shock and awe" that makes this emotion so powerful, and in turn, its use deserving of caution.

### *Consumerism*

Beyond just creating markets for products, wonder can dis-empower people, forcing them into a role of complacent consumer. While technology has advanced rapidly and amazingly, it is perceived as much more advanced than it some times is. If technological gadgets are

amazing and hard to make and magical, that means anyone on the street can't make them, and must rely on others to produce them. The same phenomenon occurs on television. Through the portrayal of amazingly beautiful people on TV, unrealistically extravagant celebrations and exorbitant lifestyles, television creates a feeling that life is not nearly as wonderful.

### *Science*

There is a question as to how much science actually understands. "By calling the unknown factor X instead of 'magic,' we are only hiding our ignorance behind a scientific term in place of an imaginative term" [30, p. 252]. Really, many people have less of an idea how major scientific principles work than magic tricks. And in some cases, that even applies to the scientists themselves, "In many ways biomedical engineers are still sorcerers' apprentices, chanting half-understood incantations and hoping for the best" [7].

Science must not set itself up as an alternative to wonder. Einstein believed that "the process of scientific discovery is, in effect, a continual flight from wonder." (<http://www.fys.ku.dk/~raben/einste>

"When I was a boy growing up in the Midwest, I was mystified by the colors of the autumn leaves. The maple leaves in particular seemed unreal, a strange shade of magenta. How could a green leaf take on this color? I remember walking home from school and picking up these leaves from the sidewalk as treasures. I had no idea what to do with them. Certainly, adults weren't interested in them; to them they were things that needed to be raked into piles and burned.

Sometime around the fourth grade, I was told in science class that the reason the leaves turned red was that the chlorophyll in the leaf died in the autumn, revealing a bright color. I appreciated that the mystery had been completely solved and I could stop wondering about it.

Unfortunately, science often serves the purpose of actively teaching us to stop wondering about things, of causing us to lose interest."

Jim Steinmeyer, 2005 [31, p. 21]

Science cannot afford to replace wonder with shallow explanations. It must seek to instill in people a deep desire to find more wonder and interest in the world around them, as it did for Feynman [12].

But, scientists have also exploited wonder. The peddlers of snake oil had company. Those swindlers were sharing the audience with purveyors of the marvels of science. As outlined in *Wonder Shows*, during the period of innovation surrounding the discovery of electricity, many “scientists” had public performances. They were showcasing new discoveries like microscopic views of bacteria and amazing electrical devices. It turns out that the bacteria had horns and eyes and looked like little devils. These illustrations were passed off as science by Katterfelto, one of most famous performers of the time[21]. Again, people desire to believe extraordinary things, including science’s incessant discovery of new information and devices. The exploitation of this feeling of awe designed to turn off thought and give credence to nonsensical theories should not be tolerated among scientists.

### *Religion*

Nor should it be tolerated in religion. Again history shows a strong relationship between wonder workers and religion. Reginald Scot, the author of the first book explaining magic secrets in 1584 had the intention “to attack witch-hunters and to demonstrate affinities between Roman Catholicism and a variety of false supernatural practices” [10, p. 75]. Even the Old Testament has citations attempting to separate the works of the church from the works of magicians like Simon, or the Pharaoh’s magicians. There are also examples of magic tricks performed in temples of worship to demonstrate the omnipotence of various gods.

This practice is not out of practice. Just recently, in Uganda, a preacher made a purchase from a magic shop. The device he purchased “gives people an electric charge, which they can pass on.” He has been accused of using this device to show the power of his religion to his parishioners. It has led to a move from government officials: “We feel there is a need for a policy on religion,” said Nsaba Buturu, Minister of Ethics and Integrity in Uganda [2]. Governments have felt the need to regulate the distribution of wonder before. “In England

at the end of the fifteenth century” there was “a series of legislative acts against itinerant performers” [10, p. 75].

Gospel magic is the present day field of magic devoted to propagating religion. It uses various magic tricks to illustrate various beliefs and the history of Christianity. In this field is important to proceed with caution so as not to overstep that agreement between a magician and his audience. The audience must always be reminded that the magician is not demonstrating supernatural abilities. Even in performing completely secular magic I have been accused of having psychic abilities which I have sometimes had to refute quite vigorously, depending on the level of confidence placed in me by the believer.

Wonder also plays a role in the religion itself. While Sam Sharpe believes “Wonder plus fear equals awe. Wonder plus love equals worship, adoration, and veneration” [30, p. 32]. I disagree. Worship is often the result of wonder plus fear, a powerful combination which can elicit complacency and devotion.

### *Interpretation*

I would like to encourage caution in analyzing these results. Historically, the attempt to quantify entertainment and turn it into a spectator driven algorithm has met with limited success. The movie industry attempted to allow movie-goers the opportunity to choose how the movie would end, allowing them to vote in theater. This practice has thankfully ended, letting movie directors decide for themselves how their creation should finish. As a magician, trying to figure out why one presentation did better than another is helpful to a point, but it should be merely a learning experience, not a rigid methodology for performance. The focus on enjoyment in this study is slightly misleading, “Magic is not engineering. Energy efficiency is not the goal” [24, p. 20]. If a magician could create a maximally enjoyable show, composed of one super-enjoyable magic trick after another, the end result may be a dud of an experience due to lack of variety or other structure.

“They began, as you did, with the aim of bringing back practical magic to the world. They were practical men and wished to apply the principles of reason and science to magic as they had done to the manufacturing arts. They called it ‘Rational Thaumaturgy’. When it did not work they became discouraged.”

From *Jonathan Strange and Mr. Norrell* [8]

## Part III

# Appendices



## Chapter 7

# Appendix A: Experimental System

The system is designed to be distributed and robust. The experiment was run in parallel each containing all of the necessary components for the entire system. The main components are: Flash front end, Ruby on Rails backend, MySQL data store, Apache webserver for video streaming, QuickTime for video recording, and Subversion for data consolidation.

A Ruby on Rails server using the Hobo plugin took care of user management, randomizing conditions, and storing event information. It was stored in a MySQL database on each laptop. Each laptop had its own block of unique IDs to use for users and events. The Ruby on Rails server was installed using Locomotive and managed with Subversion. The experiment was accessed over http on the localhost. Ruby served a Flash program, written in Flex that displayed the videos and recorded responses. The Flash program talked to the Ruby backend to record ratings and events. QuickTime was used to record the faces of the subjects. The Flash program made a sound that was recorded by the laptop's microphone. The timestamp of this sound was recorded in the database to synchronize the video recording with the tricks as they were viewed so that facial expressions can be correlated to events in the trick videos. Subversion backed the data and videos up to a centralized repository where combined results were examined.

Figure 7-1: At the height of my experiment, after suffering a hard drive failure on the main laptop



## Chapter 8

# Appendix B: Transcripts

### 8.1 Card Trick 1

#### 8.1.1 Puzzle

Here is a puzzle for you to try to figure out. I am again using a deck of cards. Please cut them if you wouldn't mind, just mix them up. Fantastic. Perfect. Now we are going to use a couple of cards to demonstrate this puzzle. We'll go through and just grab a few, it doesn't really matter which ones they are. There they go, a king and a nine. Perfect

Now what I'd like you to do, is I'll have you take the cards, and you are going to start dealing through. Okay, start dealing pile right here on the table and stop whenever you feel like it, it doesn't matter where. Right there? Okay, we are going to put the king right there. Drop the rest of the cards on top. Scoop them back up. Now do it again, Whenever you want to stop, go ahead and stop. Oop, right there? Okay we'll go ahead and put the nine right there, drop the rest on top, scoop them up. Go ahead and give them a cut on the table. Perfect.

Now this is the interesting, curious part. You shuffled the cards, mixed them up, we pulled out two random cards, you dealt wherever you like, and now they are face up in the middle

of the pack. There they are, both of them. And they've each landed next to one card. Now this is the crazy coincidence part of the puzzle. This card and this card, and this card and this card. Both of these cards, happen to match. There's another nine, and there's another king. Would you look at that, two perfect pairs.

### 8.1.2 Story

Alright, one more card trick. Same old deck of cards, nothing special. Please shuffle them, just mix them up, if you will, randomize them a little bit. That's perfect. We are going to use two cards for this trick. We'll start with a king because they are easily personifiable. There is a nice one right there, and ooh, a nice bright red nine.

We're going to talk about true love in a deck of cards. Do you believe it exists? Oh that's wonderful. Go ahead take the cards. We are going to start dealing face down, a pile, and stop whenever you get a feeling that the king has met his match. Oh! Yeah, there was no hesitation there. Go ahead put all the cards on top, pick them all back up again, That's great, and start again. This time we're looking for the partner for the nine. Right there? You sure? Okay, drop them all on top again.

Pick them all up, square them up together. Go ahead and cut half of them on to the table. And complete the cut, just like that. So now you have shuffled the cards, we pulled out two as a sample to see if there really was true love in a deck of cards. And they've been separated in the middle by a bunch of cards. They have in a sense gone on a journey looking for their mates.

The nine seems to have found someone that he is looking at very very closely, and the king has found a partner as well. Now the question is, how well in tune with the deck's frequencies are you? Could it be that the nine of diamonds has found true love, and that the king as well has found. . . . Pretty nice.

Maybe there is such a thing as true love, at least in a deck of cards.

## 8.2 Coin Trick 1

### 8.2.1 Puzzle

I'm going to demonstrate some sleight of hand using some coins. Right here in this brass Box I have four coins. Usually people do sleight of hand with only one coin at a time, but I, I am going to attempt to do it with four coins at once which makes it all the more difficult. To start with, we shall take the coins, and put them in the brass box. Once they're in the brass box, you will hold on to it, and I'm going to try to steal the coins from your hand, inside the brass box, and have them end up , one, two , three, and four coins, back in my hand. Alright? So this brass box is kind of like jail, in which they will be. And my sleight of hand is going to be excellent at getting them out. Are you ready to see this? Alright, they're going to jump from the jail into my hand. Ready, here we go. First coin. Watch, there is nothing tricky I can be doing, because they are indeed locked inside the jail. Now, will you please hold your your hand. Bring it down a little bit. Perfect. I'm going to place the coins on your hand. And now I am going to attempt to use my sleight of hand to steal the coins from the brass box? Are you ready?...into my closed fist. Ready, 1, 2, 3. Up I got it. And they're gone from there, and look right here, I managed to steal them out from your hand.

### 8.2.2 Story

I have right here, something very special. It is a little brass box with some coins inside, there they are, four coins. Right there. Now it turns out that the coins are regular coins, but the box is not a regular box, it is a time machine. I know it is hard to believe, but I will demonstrate its properties for you.

First you set the time machine. We are going to set it to a position where the coins are in my hand. So we let the time machine get used to my hand for just a moment, that should be enough. Then we place each of the coins in my hand, just like this, one, two, three, and four. We let them get used to the hand too. And we take the time machine and we set it

by pushing the button, would you just push the button please. That is exactly all it takes, now the time machine has been set to this moment in time. Remember it, with the coin box here, and the coins here, that's how the time machine is set.

Now we get to travel through time, are you ready? One coin, two coins, three coins, four coins, in the time machine, but I'd like you to hold out your hand please. Bring it down just a little please, that's fantastic. And over a little bit, because we have got to get the time machine right back, exactly where it was. Now with your other finger, just reach out, wait for it, I've got to close my hand first. I want you to push the button on the top. Be very careful! One, two, three, go.

They went back in time to when the coins were not there, the coins were right over there. That's my time machine.

## **8.3 Altoids**

### **8.3.1 Puzzle**

Time for another magic trick. This one is a super challenging trick, but I am so dexterous I am going to be able to do it without you seeing how its done. I've got some Altoids right here. Now watch carefully, I'm not going to touch them until the end of the trick. First, please take a card, anyone you want. You can reach out, anyone, doesn't matter, try to make it random. I'll still be able to find your card. Now just so you remember and don't try and trick me, I'm going to have you write your name on it. Please just write your name on the front of the card. I won't watch. You're done? Alright now go ahead and put it back anywhere it doesn't matter and watch, this is it, it's gonna happen so fast, it just happened. Right there, the trick is over. Inside this Altoids box, your card was right here in this deck of cards, no longer is it there, it is now inside the Altoids box. Open that up please. Ah! I am so good, look, I put it inside this Altoid's box, inside the bigger one. Go ahead open that up. Look inside this tiny little one, hold it up, open it up so that everyone can see, show it to the camera. Show it to the camera right there. Look at that, you see

there is your card. What was your card? Can you tell me what it was? The 10 of Clubs, open that up and show everyone. With your signature. The 10 of Clubs, and you didn't even see how it was done.

### **8.3.2 Story**

You know, cards can really get a mind of their own on occasion. So, to demonstrate this, I brought a box of Altoids. Now you will realize why this is important in just a moment. In the first place, we need you to pick a card to express some of its more human attributes.

Please go ahead, just touch one card, and pull it out. Look at it. Remember what it is, and show it to the camera. Sign your name on the front of the face, that way this card gets a little bit more of a human personality. Are you done yet? Ok, super. Put it back somewhere in the middle, perfect.

Now watch, I'm going to blow on the deck in just a moment, watch this. Now, your card smelled my bad breath and jumped right here, into the Altoid box. I know its rather hard to believe, but if you saw my breath, you'd do the same.

Go on, open it up. Open it up, Another tiny little Altoids box. Open that one up please. There it is, your card, folded up, jumped all the way inside the altoids box. Will you unfold it and show it to the camera so they can verify it's actually yours. The ten of clubs, with your name on it. It really did not like my breath one bit.

## **8.4 Straw and String**

### **8.4.1 Puzzle**

I am going to try something now. I'm going to let you try it too. Go ahead, just take a straw, if you will. We are going to use a straw and some string. We'll go ahead and cut, and measure this string, just a little bit longer than this straw. Fine, right about here.

Perfect, and I'll do the same thing. Watch. Great. Now you can take your string and your straw, pull off the end of the straw so that you can see the end of the straw through the paper. Excellent and do the other side just like this. Now you are going to take your string and slide it through your straw, just like this. Not so hard. Alright, it should come out the other side. Great, you got it?

Now I want you to try and follow everything I do as closely as possible from here on out. And see if you can end up with the same result I do. We are going to cut the straw, and the string in half. Right now, we want to try and hit the middle, so try and line up your string with the middle. Fold you straw in half at the middle. Just like this. That looks good. Fantastic. Now we are going to cut it, right in the middle, exactly in the middle. And make sure you are doing it exactly as I'm doing it. Now go ahead and take the scissors, cut it. There you go, now hold it up. Hup, you weren't doing it exactly as I was doing it. You dropped a piece. You have to pinch them to keep the piece up there. I'll let you catch up.

Now watch carefully, you have the two pieces hanging down, if I pull this one, the other one moves. It gets shorter. And I pull this one back and the other one gets shorter. I don't think yours does that. Now watch, this is the nicest part. You take your string and rub it just a little bit, and remove one piece of straw, and the other piece of straw, and look, my string has restored itself.

#### **8.4.2 Story**

Alright, let's get existential for a moment using some straws, please take one, and I'll take one, and some string. Leave your straw here. We are going to talk about the true self. I am going to give you some true self, There you go. And I'll take some true self for myself. In this case the string is going to represent the true self, and the straw will be our real self.

Go on, pull of the ends of the straw like this. Now what we are going to do after that, is slide your true self, inside the superficial self, the exterior. So you might think of the string as your soul, your essence, or whatever it is that is inside, what other people can see, the outside, which is the exterior of the straw. Now we are going to talk about hard times and

trouble. And that trouble is going to be cutting ourself in half. It is kind of like the old sawed later, but a little bit safer.

We are going to fold ourselves in half first, so that we can find our center. Go ahead, center yourself, excellent. Perfect. Now, once you've done that, we are going to go ahead and cut ourselves in half. Just like this. Just cut our straw and our string in half. Make sure you pinch it to keep it from sliding out. Up, that's okay, just slide it back in there, would you.

Alright, so here is our true self, sort of severed, or appearingly severed, while our exterior self is truly severed, watch. My true self is not severed, it is still connected. You can cut the outside, but on the inside you are still perfectly intact. And in fact it was all an illusion that our interior self could even be cut in half, because though our shell may seem to shattered, our interior self, is indestructible.

## 8.5 Six Card

### 8.5.1 Puzzle

I'd like to demonstrate a little puzzle using six cards. There they are. This puzzle involves you picking one card, so I'd like you to right now, just think of one of the cards, have you got one? Great. Now what I'd like you to do is just reach out and touch the card you are thinking of. Okay, the eight of diamonds, perfect. This is an interesting puzzle because, as I am about to show you, you did not choose the three of spades, or the eight of hearts, you did not choose the king of hearts or the ten of clubs. You didn't choose the four of clubs either. None of these cards are yours, none of these cards at all. And you notice they are all red-backed. YOU picked the eight of diamonds, which, coincidentally happens to be the only blue-backed card.

Interesting little coincidence, but we'll try it again to prove that it was not a coincidence. Go ahead, just touch any card, any one. The queen of hearts, fantastic. Again you had a free choice for the queen of hearts. YOU could have picked the nine of hearts or the three

of spades, both blue backed cards. Or these two, yep all blue, of course they were all blue. But no, none of these cards were good enough, you wanted the queen of hearts, which is the only, you guessed, it, the only red-backed card. Interesting little puzzle.

## **8.5.2 Story**

The power of persuasion is extraordinarily strong. To demonstrate this, I am going to try to persuade you of something. It is hard to believe. So first, just think of one of these cards, any one. Point to it please. So that the camera can see it. That one right there, the eight of diamonds. Now I am going to be extraordinarily persuasive. I am going to try to persuade you that the three of spades and the nine of hearts were not good for you, the queen of hearts, the ten of clubs, equally bad, the four of clubs, all of these red-backed cards were bad for you.. Now I am going to try and persuade you that you picked the only blue-backed card. You did, I am not kidding. I persuaded you into believing it had a different colored back.

You think it really had a different colored back? Well I'll prove it didn't. I'll do it again, this time I'll persuade you differently. Alright, the queen of hearts, now watch, I'm going to persuade you entirely differently. This time, the nine of hearts and the three of spades, both of these cards are blue-backed. The nine of diamonds, the four of clubs, blue, all blue except for one. Again, I'm going to persuade you that you picked the only different one. The only red backed card... the queen of hearts. It's true, look. The power of persuasion is extraordinarily strong.

## **8.6 Card Trick 2**

### **8.6.1 Puzzle**

Alright, I'm going to attempt some sleight of hand. Only this time I'm going to attempt to do it under challenge circumstances. Pick a card, you know the drill. Perfect. Excuse

me, Show it to the camera. I'll have you put it back somewhere in the deck, you can put it right there. Excellent. Now what I'm going to do is I'm going to attempt to lose your card somewhere in the middle and then show you some cards that are not yours, hopefully, and do sleight of hand with those cards, even after you've confirmed that they are not your card. So first let's get some cards.

Is this your card? Alright, we shall use that one. And let's find another one. How about this, is this your card? No? Alright. A couple more. How about that? No? Excellent, we need one more card that's not yours. Is that yours? No? Excellent. So we'll use these four cards. These four cards, and leave this one here. Alright, now my goal is to do sleight of hand with these to make your card appear in this packet of four. Let's reconfirm one more time. This isn't your card is it? Not your card, excellent. How about this one? No, not your card. This one? So none of these four cards is your card.

Now, even after you have doubly confirmed we are no going to attempt to do some sleight of hand, now watch. You won't even see a thing. Up, there, I did it. Now this card right here, I have switched to be your card. Look at that, the two of hearts. Thank you.

### **8.6.2 Story**

I've always believed, that if you want something enough, you can make it come true. So I am going to have you pick a card, perfect. Look at it, show it to the camera, and I want you to remember it, because I am going to ask you to want this card more than anything in the world. And hopefully your desire will be able to change reality. Toss your card, perfect. We're going to lose it in the middle of the deck, and we're going to try and pick some cards that aren't yours.

Alright, you remember what your card was? I need you to want it with all your heart, and all your soul in just a moment. I am going to show you this card, is this your card? No? Okay, we'll put this one down, and use that one. We'll try to find another one that is not your card. Is that your card? No, okay, we'll use that one, and how bout this one? No, that's not yours? Okay, were just collecting some cards that are not yours. Is this it, No? Okay that should be enough.

We'll have you look at these cards again one more time, just to confirm that none of these are yours. How about this one? Is that it? No. Good. We're going to have you want your card more than anything in just a moment. Is this your card? No. How about this one? None of these are your card.

Okay now is your moment of desire. I want you to want your card to be on the table, right here, face down, more than anything in the world. I want you to want it, desire it right now. Now if your desire is truly strong enough, your card right here should have changed, what was your card again? The two of hearts? Excellent, your desire was strong enough, congrats.

## **8.7 Coin Through Elbow**

### **8.7.1 Puzzle**

I'm going to challenge you to watch this coin here. I'm going to make it disappear from one spot on my elbow, are you ready? Now watch carefully. Just rub it right in just like this and...da da da da. Uh, alright, I'm going to try again, here we go. I'm gonna make the coin disappear, and you're not gonna see it. Watch very closely, I'm going to rub it into my skin... There, up, there, you didn't see that did you, it's gone. The coin has disappeared. Now I'm going to make it come back, not there but over here. Watch. there. Up. And it's back. Just like that. Nice sleight of hand huh? Here we go one more time. Make the coin rub in, and. It's not easy I tell you, there we go. Ope! there we go got it, and right back out the other side. Tough, but I'm pretty good.

### **8.7.2 Story**

The nature of work. We are going to use this coin to represent work for just a moment, and this is the goal of our work. We're gonna use one elbow, as silly as it may seem. The goal is to sort of rub the coin into my elbow, and I'm really focusing on it. And sometimes

when you focus on things, you focus too hard. You are just unable to succeed. No matter how hard you focus, you are trying trying trying trying to reach your goal, and you just can't make it happen.

Now the thing to remember is that sometimes when you try too hard, your focusing your energy in the wrong place. And you just have to realize you are focusing on the wrong place and need to let your mind slip a little bit, a little loose. Think about exactly what you are trying to goal. Consider maybe there are different options, not just there, but over here on this side. And then reevaluate, go back and it will become easier to find your goal.

Let's try that again. Remember you don't focus so hard that you lose your concentration, but you keep your mind in that steady state, just like water, and then, everything seems to jump as it's supposed to.



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