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(1527-1593)

Observation and Categories

Review

- Argument form for confirming hypotheses
If the hypothesis under investigation were not approximately true and a plausible alternative explanation were not true, then this prediction would not be very unlikely to be true
The prediction is true
∴ The hypothesis is approximately true or a plausible alternative explanation is true
- To the degree (and only to that degree) that we can rule out an alternative that explains the same prediction, we can infer that the hypothesis under investigation is true.

Review

- Arguments falsifying hypothesis
If the hypothesis is true AND all auxiliary hypotheses needed to make the prediction are true AND if the experimental setup is adequate, then the prediction will be true
The prediction is not true
∴ Either the hypothesis is false, an auxiliary hypothesis is false, or the experimental setup is not adequate.
- To the degree (and only to the degree) that we are sure that no auxiliary hypothesis is false and that the experimental setup is adequate, we can infer that the hypothesis is false.

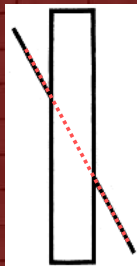
Review: Fallibility

- Both the procedures for confirmation and falsification leave open additional possibilities
 - That an alternative hypothesis which explains the same prediction is true
 - That an auxiliary hypothesis is false or that the experimental procedure was inadequate
- As a result, neither confirmation or falsification give absolutely definitive results
 - the conclusions about a given hypothesis must be regarded as fallible
- Although at a given time we might have high confidence in the results of science
 - even the best established claims might later be rejected
 - what are thought to be highly implausible hypotheses might be accepted.

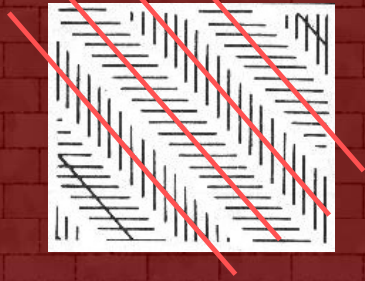
Preview

- At the foundations of science are procedures for gaining *evidence* about the world
- We learn about the world through our five senses
- We are reliant on them for our evidence
 - Tests of predictions ultimately rely on *observation*
 - Observations with the unaided senses
 - Observations made with the use of instruments
- Before observations can be used for testing predictions, they must be brought under *categories*
- Two fundamental questions about observation
 - How reliable are observations?
 - What does categorization involve?

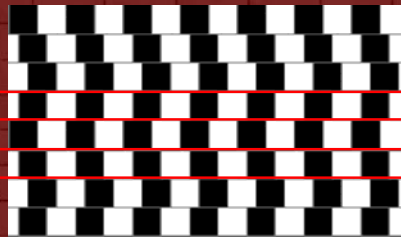
Is this line straight?



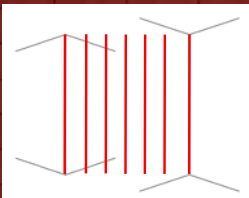
Can these lines possibly be parallel?



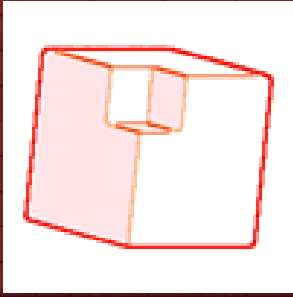
How about these?



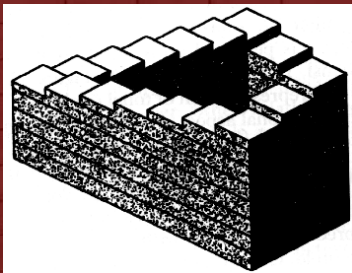
Muller Lyer Illusion



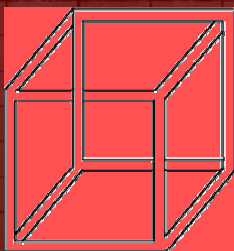
Seeing More than One Thing



Seeing what isn't possible



Seeing what isn't possible - 2



Ambiguities in real vision



Perception seems transparent

But it relies on

- The way in which the visual system is constructed
- The effects of attention
- What we have previously learned
- What we expect to see

It does not provide unmediated access to the world

How can we determine what is really out there?

Beyond mere registration-- identification

- Vision (hearing, smelling, etc.) requires more than mere registration of stimuli on our senses
- It requires that we identify what we see—recognize an object as a tree, a street, or a car
- We typically only recognize those things with which we are already familiar
 - How, then, do we discover new things?
- We only recognize things in contexts where they are expected

Recognizing



Familiar objects are often when seen from an unusual perspective



The importance of context

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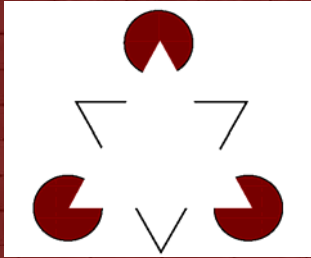
Seeing with missing parts

We can also recognize things from partial information



That can be good, but can it also mislead us?

Illusory contours



Word Superiority Effect



Why proof reading is hard

We see what we expect to see and so mis errors

This is especially true when we have written the text and now what is supposed to be there.

To illustrate, I can replace every letter of a sentence with an x, and you still can recognize the word with some difficulty.

What do you see?



Count the f's

Federal fuses are the result of years of scientific study combined with the first-hand experience of fifty years.

Count the F's - 2

Federal fuses are the result of years of scientific study combined with the first-hand experience of forty years.

A problem not just for science

- What profession relies heavily on people's reports of what they have seen?
 - In law, the problem is known as the problem of eye-witness testimony
 - It is compounded by the fact that after witnessing an event, one's memory of the event may be affected by what else one learns
 - Even by what questions one is asked

Loftus on Eye-Witness Testimony



Showed subjects a video in which there was a car accident at a stop sign

- Half the subjects later asked a question about a yield sign ("how fast was the blue car going when it went past the yield sign?")
- Those who heard the misleading question were more likely to later remember the video as having a yield sign.

In other studies, people "recalled" a conspicuous barn in a bucolic scene that contained no buildings at all, broken glass and tape recorders that were not in the scenes they viewed, a white instead of a blue vehicle in a crime scene, and Minnie Mouse when they actually saw Mickey Mouse.

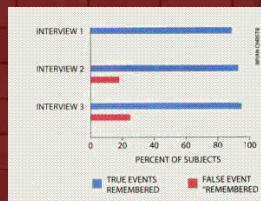
Hyman Study

In recollection study subjects given one false event amongst several real ones
overnight hospitalization for a high fever and a possible ear infection
birthday party with pizza and a clown

No recall of false event on first interview

20% recalled something of the false event on second interview

One person remembered a male doctor, a female nurse and a friend from church who came to visit at the hospital.



I was certain, but I was wrong

By Jennifer Thompson

In 1984 I was a 22-year-old college student with a grade point average of 4.0, and I really wanted to do something with my life. One night someone broke into my apartment, put a knife to my throat and raped me.

During my ordeal, some of my determination took an urgent new direction. I studied every single detail on the rapist's face. I looked at his hairline; I looked for scars, for tattoos, for anything that would help me identify him. When and if I survived the attack, I was going to make sure that he was put in prison and he was going to rot.

When I went to the police department later that day, I worked on a composite sketch to the very best of my ability. I looked through hundreds of noses and eyes and eyebrows and hairlines and nostrils and lips. Several days later, looking at a series of police photos, I identified my attacker. I knew this was the man. I was completely confident. I was sure.

I was certain, but I was wrong

I picked the same man in a lineup. Again, I was sure. I knew it. I had picked the right guy, and he was going to go to jail. If there was the possibility of a death sentence, I wanted him to die. I wanted to flip the switch.

When the case went to trial in 1986, I stood up on the stand, put my hand on the Bible and swore to tell the truth. Based on my testimony, Ronald Junior Cotton was sentenced to prison for life. It was the happiest day of my life because I could begin to put it all behind me.

In 1987, the case was retried because an appellate court had overturned Ronald Cotton's conviction. During a pretrial hearing, I learned that another man had supposedly claimed to be my attacker and was bragging about it in the same prison wing where Ronald Cotton was being held. This man, Bobby Poole, was brought into court, and I was asked, "Ms. Thompson, have you ever seen this man?"

I was certain, but I was wrong

I answered: "I have never seen him in my life. I have no idea who he is."

Ronald Cotton was sentenced again to two life sentences. Ronald Cotton was never going to see light; he was never going to get out; he was never going to hurt another woman; he was never going to rape another woman.

In 1995, 11 years after I had first identified Ronald Cotton, I was asked to provide a blood sample so that DNA tests could be run on evidence from the rape. I agreed because I knew that Ronald Cotton had raped me and DNA was only going to confirm that. The test would allow me to move on once and for all.

I will never forget the day I learned about the DNA results. I was standing in my kitchen when the detective and the district attorney visited. They were good and decent people who were trying to do their jobs – as I had done mine, as anyone would try to do the right thing. They told me: "Ronald Cotton didn't rape you. It was Bobby Poole."

I was certain, but I was wrong

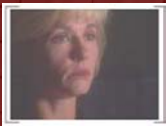
The man I was so sure I had never seen in my life was the man who was inches from my throat, who raped me, who hurt me, who took my spirit away, who robbed me of my soul. And the man I had identified so emphatically on so many occasions was absolutely innocent.

Ronald Cotton was released from prison after serving 11 years. Bobby Poole pleaded guilty to raping me.

Ronald Cotton and I are the same age, so I knew what he had missed during those 11 years. My life had gone on. I had gotten married. I had graduated from college. I worked. I was a parent. Ronald Cotton hadn't gotten to do any of that.

Mr. Cotton and I have now crossed the boundaries of both the terrible way we came together and our racial difference (he is black and I am white) and have become friends. Although he is now moving on with his own life, I live with constant anguish that my profound mistake cost him so dearly. I cannot begin to imagine what would have happened had my mistaken identification occurred in a capital case. . . .

Jennifer Thompson and Ron Cotton



The man on the left, **Ron Cotton**, who spent 11 years in prison for the rape of Jennifer Thompson. The man on the right is the rapist Bobby Poole

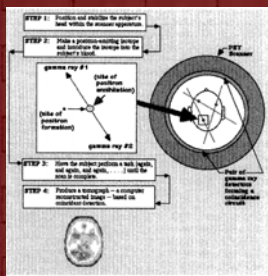
Evaluating observation

- If perceiving depends so much on us
 - and we can be so unreliable
- How can we determine what is really out there?
- No absolute guarantees! Even perception is fallible!
- Importance of independent observers
- Importance of plausibility assessments

Extending observation with instruments

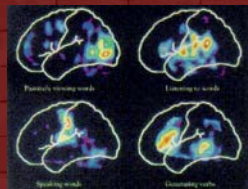


Positron Emission Tomography



What does this have to do with mental activity?

Use of subtraction to isolate brain operation associated with one mental activity



Instruments and Artifacts

- The use of instruments to make observations raises just as many problems (or more) than the use of our senses
- Is the product of the instrument *merely* an artifact?
 - Something made up by the instrument and not reflective of the world *out there*
- How to tell?
 - As with basic perception, we must rely on
 - Multiple independent sources agreeing
 - The plausibility of what we claim to observe
