# What does Science Teach Us?
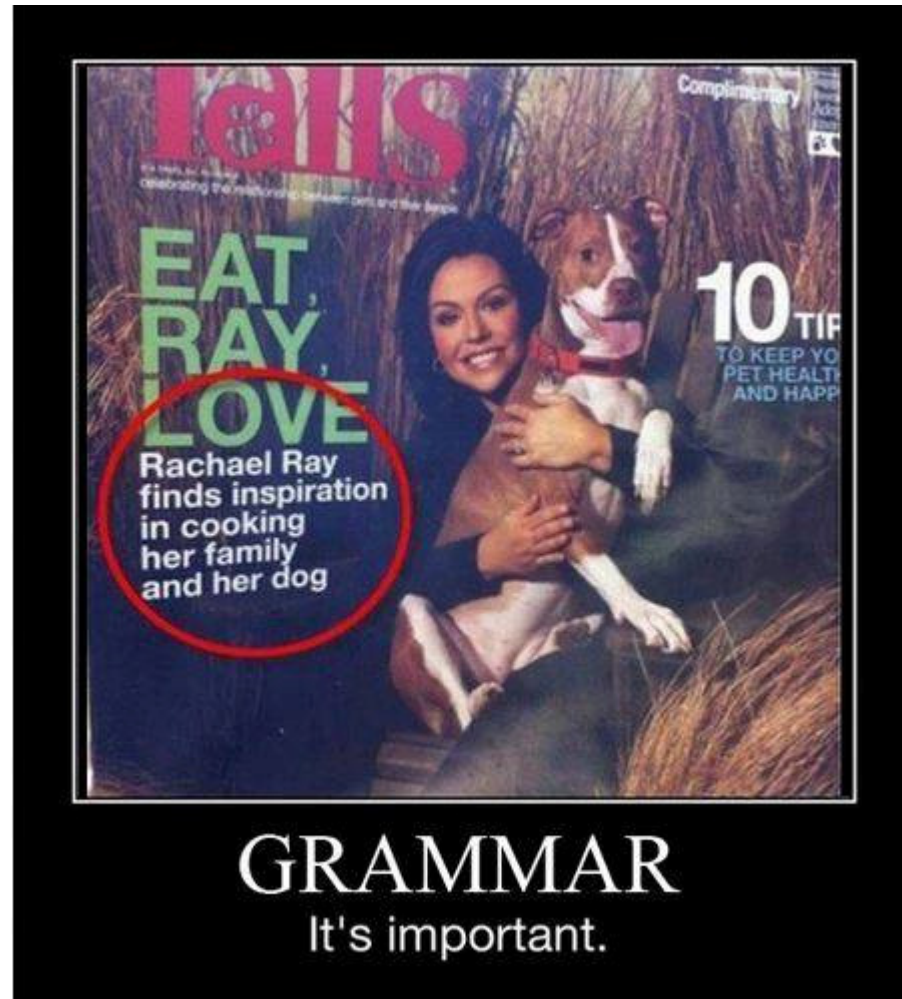
(1) There are patterns in nature
(2) Careful thinking is necessary. We need to be precise. The world is nuanced.
(3) Knowledge is grounded in reality.



OOPS! YOU ADDED TOO MUCH:

BUTTER  SUGAR
FLOUR  BAKING SODA
EGG  MASS

# Attention to Detail and Being Precise



Omitting small details can lead to different meanings.

# Attention and Being Precise

I'm giving up drinking for a month.

Sorry. That came out wrong.

I'm giving up. Drinking for a month.

# **Attention and Being Precise**

# Attention and Being Precise



**Sully Has No Resolve**
@sullyhasthots

There is a vas deferens between the word they used and what they meant

**Taylor Swift Facts** @TSwiftFTC · 1d
4 Years ago today, Taylor Swift looked urethral at the Golden Globe Awards.

3:57 PM · 1/8/23 · Twitter for iPhone



**Lincoln Michel** ✔
@TheLincoln

Sending this to my students to explain why you put titles in quotes...

**Manley** @LordManley · 22h
That took me a moment.

2:43

Avril Lavigne singing Bite Me on The Dick Clark Rockin New Years Eve 2022 Show
avrilscult · 2.1K views · 2 days ago

7:19 AM · Jan 5, 2022 · TweetDeck

**710** Retweets   **23** Quote Tweets   **2,866** Likes

# Attention and Being Precise

This is why correct spelling is important

I love when I can smell a guy's colon as he walks by 😍

# **Attention and Being Precise**

Finally, somewhere I can take my Croissant Bernard.

## Movie Theater Plays Wrong Guardians Movie Three Times In a Row

Fans eager to see <u>Guardians of the Galaxy</u> got a disappointing surprise at a Regal Cinemas this week. The debut-seeking crowd watched in horror as the screen before them played the open scene not of the badass comic-based movie, but of 2012's Dreamworks kids flick, <u>Rise of the Guardians</u>. Not the same!

# Attention and Being Precise



**KNOW THE SYMPTOMS:**

| CORONAVIRUS | FLU | ALLERGIES |
|---|---|---|
| • Fever | • Fever | • Itchy eyes |
| • Dry cough | • Cough | • Congestion |
| • Shortness of breath | • Runny nose | • Runny nose |
| • Fatigue | • Body aches | • Sneezing |
| | • Headache | • Coughing |
| | • Sore throat | |
| | • Fatigue | |

SOURCE: CDC

# **Attention and Being Precise**

| **COUGAR TRACKS** | **DOG TRACKS** |
|---|---|
|  |  |
| • Tracks do not generally include claw marks because cougars have retractable claws.<br><br>• The heel pad has three distinct lobes at the base of the heel pad, forming an "M" shape. | • Tracks will usually include claw marks.<br><br>• Tracks of dogs' rear pads are more rounded. |

# Attention and Being Precise
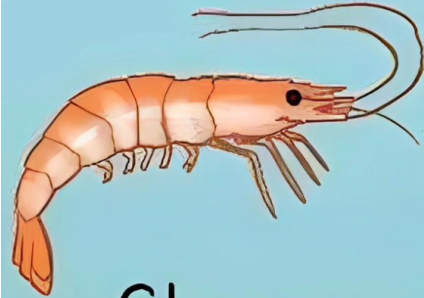


Shrimp
- Mostly found in salt water
- Smaller
- Part of sub-order Pleocyemata
- Plate-like gills
- Curled body
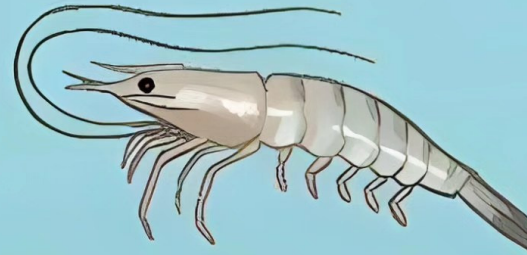
Prawns
- Mostly found in fresh water
- Bigger
- Part of sub-order Dendrobranchiata
- Branching gills
- Straight body

# Details Make the Difference
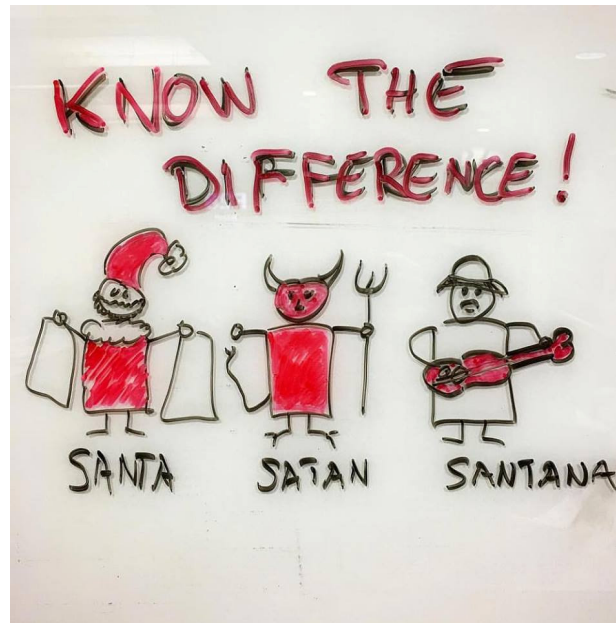
# <u>Testing Claims and Precision</u>

When forming a hypothesis, you need to be precise.  Several questions may look alike but may be quite different.  One of the great strengths of science is the collection of data (empirical evidence) to test claims and answer questions.  However, if you aren't paying attention being precise, you could be collecting data that is not relevant for your question

For example, the following questions are similar, but have different answers.

<u>Question 1:</u>
You have flipped a coin and gotten 5 heads.  What are the odds the 6<sup>th</sup> flip of the coin is heads?



<u>Question 2:</u>
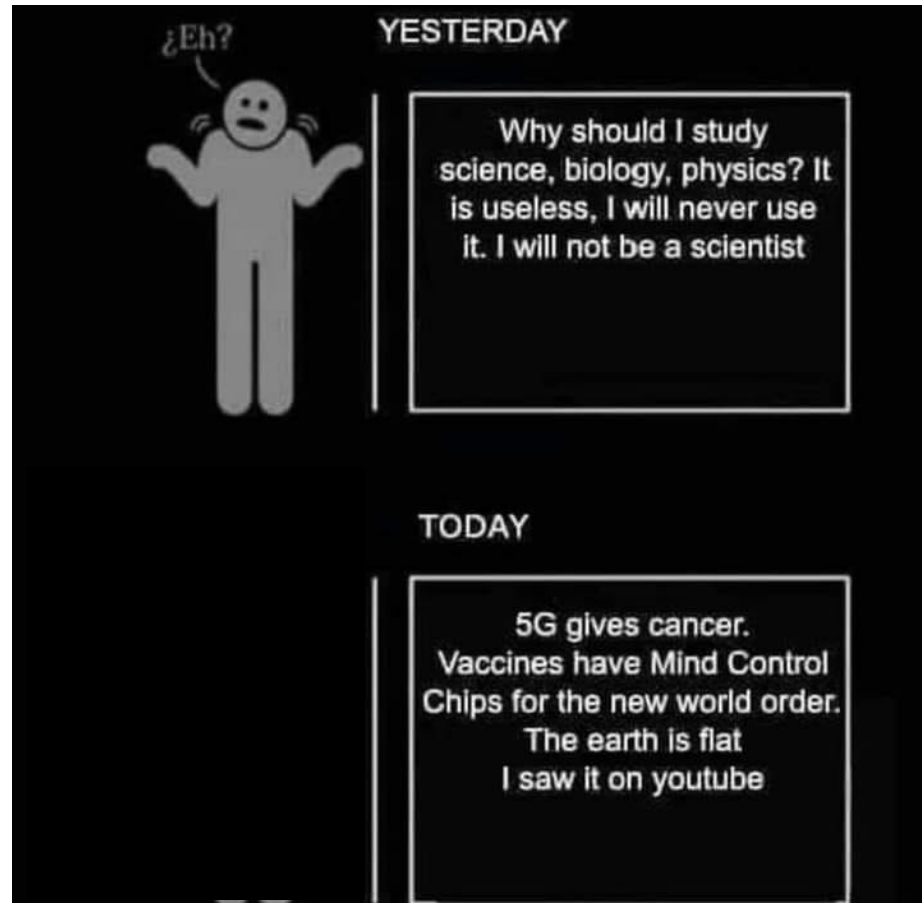What are the odds of flipping a coin and getting 6 heads in a row?

# Why is Learning about Science Important?

# Psychologists Use the Scientific Method

Whether you are a psychologist, in business or medical field, you will probably needs to evaluate a claim or describe what is happening.  To do this, you will need to use some version of the scientific method.  There is no one scientific method, though many methods have similar processes to assess claims with empirical evidence.

Your textbook lists 5 steps (page 27):
1. Formulate a theory
2. Develop a testable hypothesis
   - hypothesis (see page 27)
   - operational definition (not in your textbook)
3. Test with a Research Method (to collect empirical data)
   - empirical evidence (your book discusses empiricism, page 5, but not empirical evidence)
4. Analyze the Data
5. Share the results and conduct more research

The scientific method is a process used to assess claims through empirical evidence while minimizing individual biases.
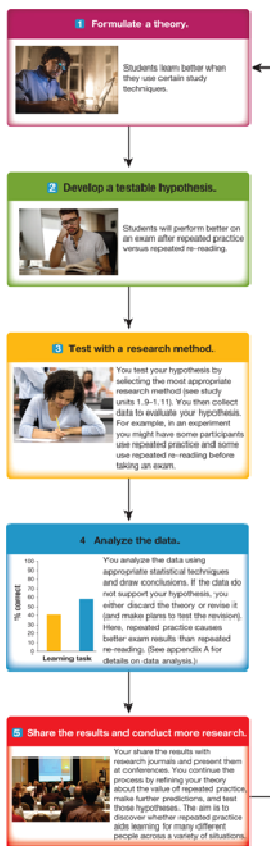
FIGURE 1.17

FluxFactory/Getty Images, damircudic/Getty Images, SDI Productions/Getty Images, and SDI Productions/Getty Images;
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# Psychologists Use the Scientific Method

Key terms
- theory: A series of interconnected ideas or concepts that explains what is observed in research and that makes predictions about future events (page 25).
- hypothesis: A specific testable prediction of what should be observed in a study if a theory is correct (page 26).
- operational definition: A relatively precise description of how a variable, concept is identified, measured or changed.
- empirical evidence: Verifiable evidence that is based upon objective observation, measurement, and/or experimentation.

# Testing Claims: Hypotheses

To discover information about the natural world, scientists make a specific prediction about some phenomena—they generate a <u>hypothesis</u>.

- <u>Hypothesis:</u> A specific, testable prediction of what should be observed in a study if a theory is correct (page 27). It is sometime described as a tentative statement about the relationship between two or more variables; A testable prediction or question.

Usually, a hypothesis is a specific prediction about some phenomena. A hypothesis often takes the form of an "if-then" statement.

Hypotheses can be generated from theories—our understanding of the world around us. People often use the word "theory", when they mean

- <u>Theory:</u> A series of interconnected ideas or concepts that explains what is observed in research and that makes predictions about future events (page 25).

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<u>Examples of hypotheses:</u>
1. If we make cars more <u>fuel efficient</u>, then it will make them less <u>safe</u>.
2. If we have our employees <u>wear backbelts</u>, then we can reduce the <u>number of workplace injuries</u>
3. Driving while <u>using a hands-free cell phone</u> increases the <u>risk of accidents</u>
4. Drug testing reduces workplace accident.

## Examples of non-hypotheses:

5. If you go to the bar, I will divorce you

# Developing a Testable Hypothesis: Operational Definitions

When the scientist tests the claim or hypothesis, they must <u>operationally define</u> the variables they are testing by identifying variables and quantifying them so they can be measured.  In other words, a relatively precise description of how the variable or concept in a study will be manipulated, measured or identified.  These definitions should be such that they could be assessed by anyone and produce similar results.
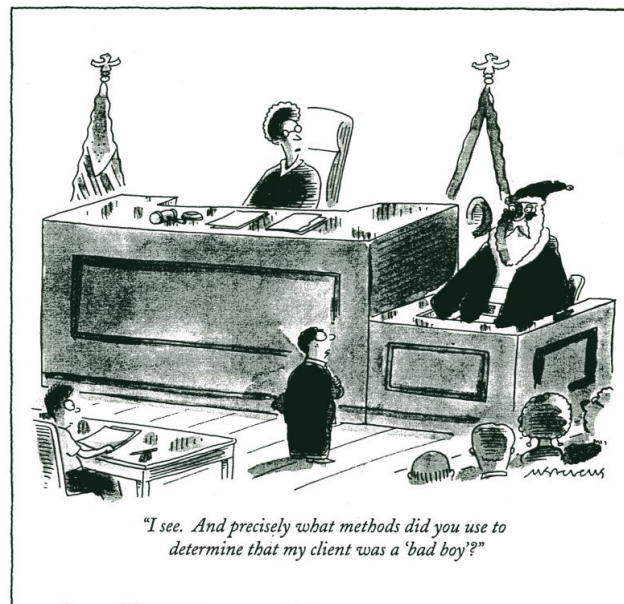


"I see.  And precisely what methods did you use to determine that my client was a 'bad boy'?"

Image source: unknown

A "bad boy" means different things to different people.  We need to define it in a way that we are using consistent definitions that allow us to identify "bad boys".

# Developing a Testable Hypothesis: Operational Definitions

Examples of operational definitions:
- **Intelligence** is operationally defined as a score in the WAIS (Wechsler Adult Intelligence Scale).

| 85 | 100 | 115 |
|---|---|---|
| Below average intelligence | Normal intelligence | Above average intelligence |

- An **unsafe driver** is a driver who has gotten into 3 accidents within a one-year span.
- The executive branch of the federal government wants to operationally define "fast food" jobs as "**manufacturing jobs**" (why?).  a less appropriate op def
- Use of **inappropriate language**
- A **serving size** is defined as…

# **Developing a Testable Hypothesis: Operational Definitions**

If you don't have operational definitions, you run into problems such as the following results:

- 60% of surveyed high school students rated themselves in the top 10%
- 25% rated themselves in the top 1%

They used different operational definitions of what is best, such as math, sports, music, art, glee club, social friends.

# **Operational Definitions**

## Concepts that are difficult to operational define

- What is greed?  What is being generous?
- What is being biased?
- What is open-mindedness?
- What defines value?
- What is gambling?
- What is inappropriate language?
- What is a bonafide relationship?
- What is harassment?
- What is beef?

## **Testing claims: Data (Empirical Evidence)**

Once a scientist has a <u>hypothesis</u> and <u>operationally</u> defined their variables, the hypothesis must be <u>tested</u>, and <u>data</u> (empirical evidence) collected.

A testable hypothesis is one that can be assessed.  When assessing a hypothesis, scientists rely on the collection of <u>data</u> (empirical evidence) to assess claims (think Mythbusters ).

<u>Empirical Evidence:</u> Verifiable evidence that is based upon objective observation, measurement, and/or experimentation.

Apply the idea of empirical evidence to these hypotheses:

- If we make cars more fuel efficient, then it will make them less safe.
- If we have our employees wear backbelts, then we can reduce the number of workplace injuries.
- Driving while using a hands-free cell phone increases the risk of accidents
- Drug testing reduces workplace accident.
- Can chicken's activate an iPad?
- Magnets ruin credit cards.
- 3-person katana.
- Carts that lock the wheels when leaving the parking lot.