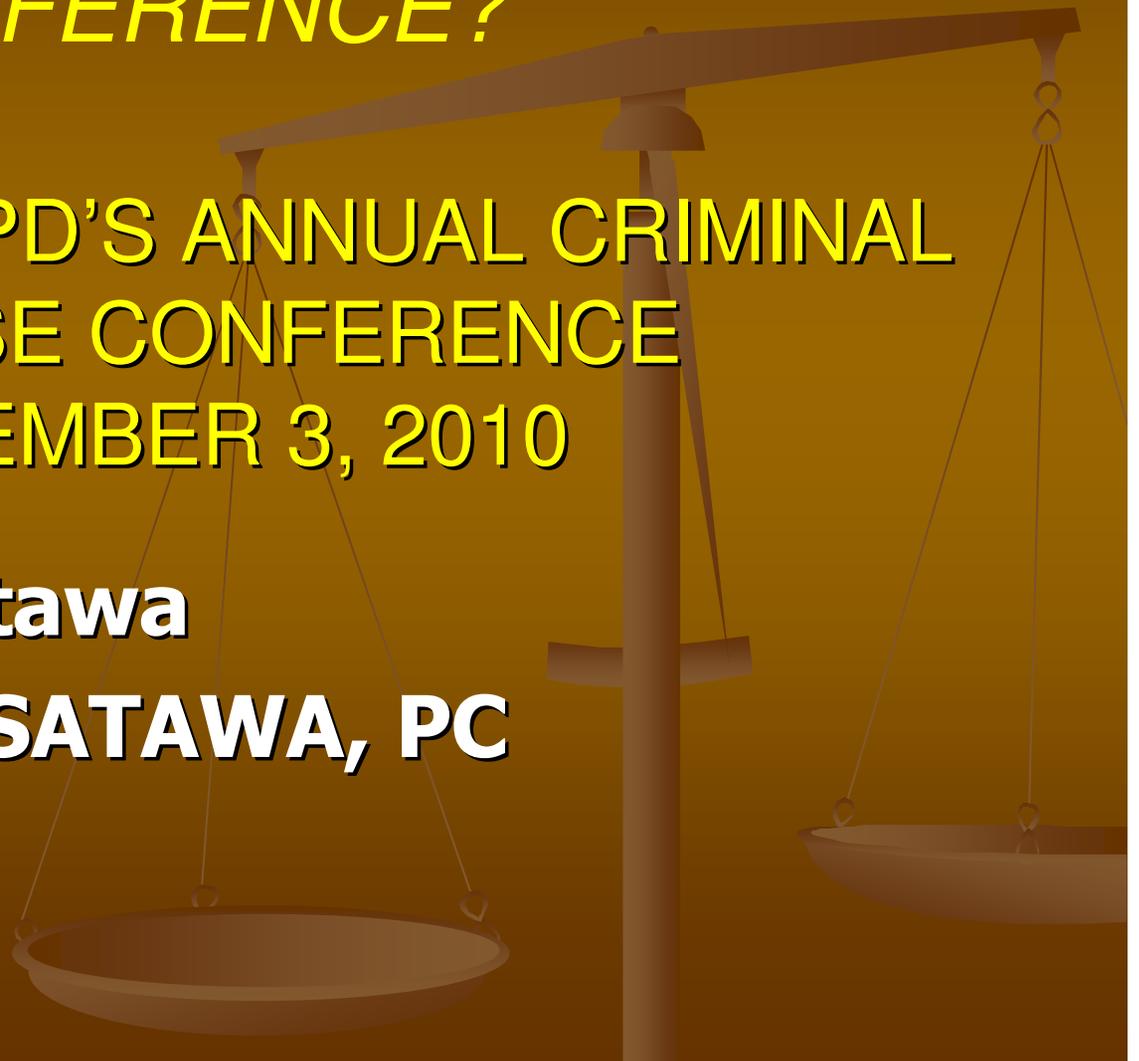


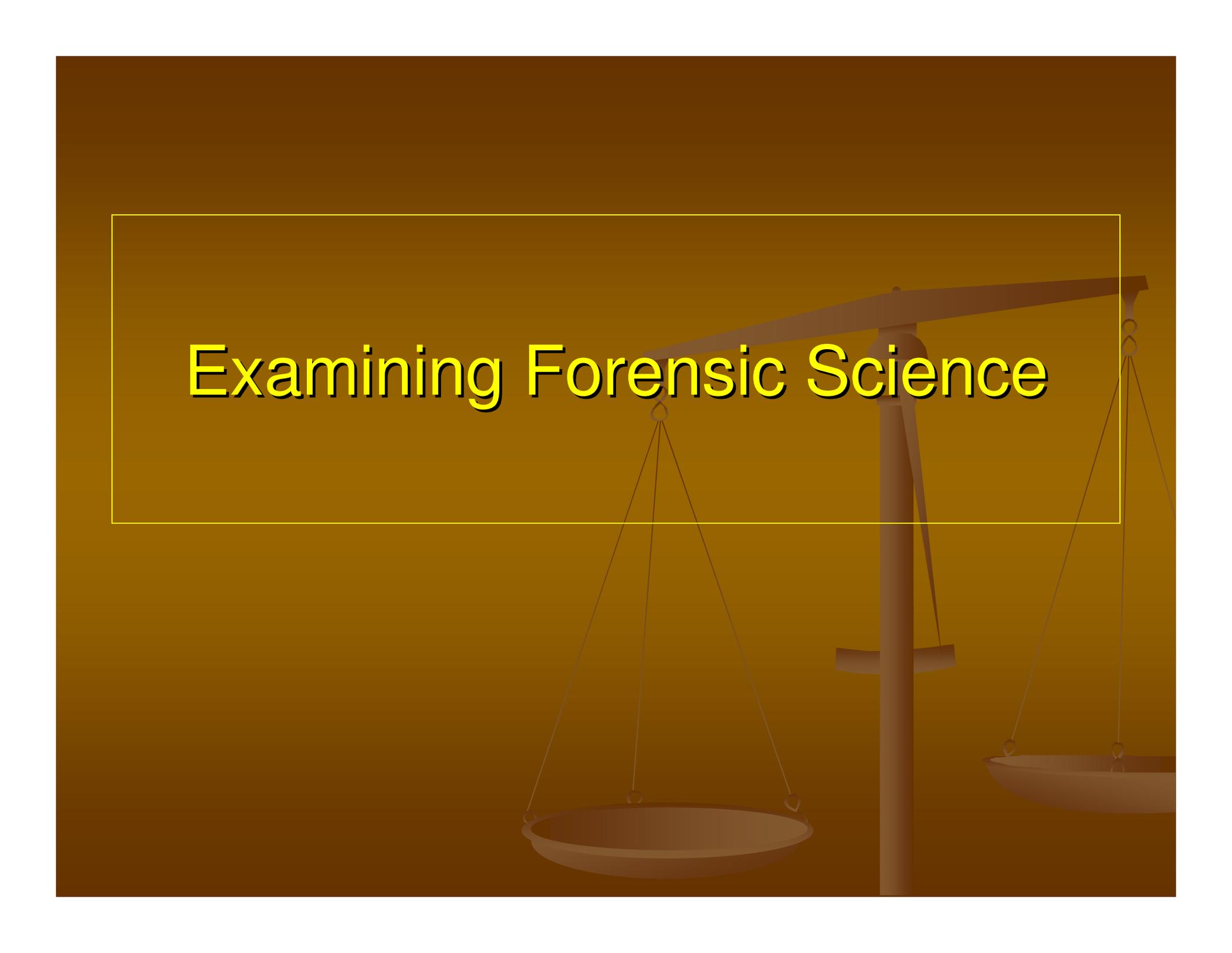
*FORENSIC SCIENCE vs. JUNK
SCIENCE – WHAT'S THE
DIFFERENCE?*

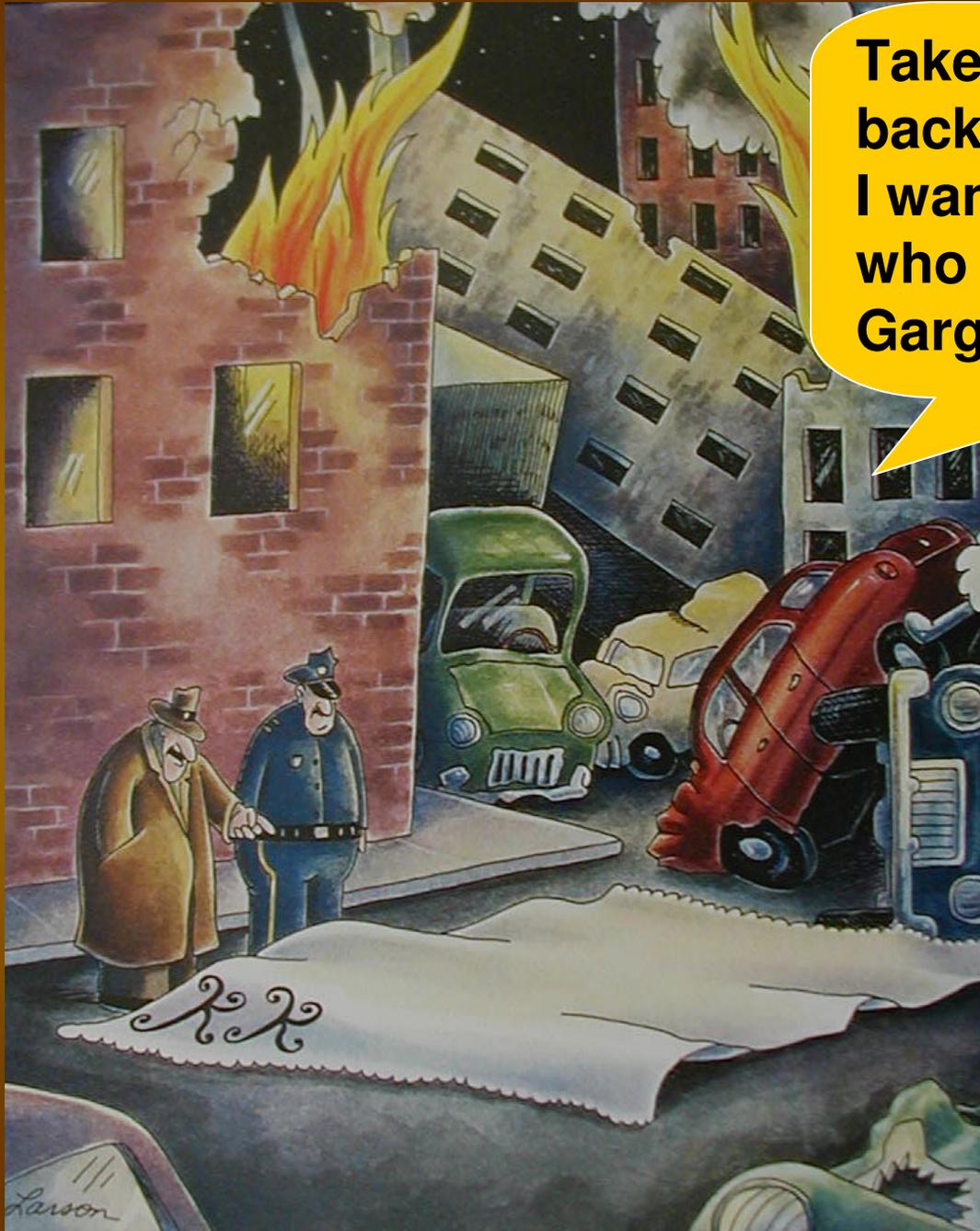
WISCONSIN SPD'S ANNUAL CRIMINAL
DEFENSE CONFERENCE
NOVEMBER 3, 2010

Mark A. Satawa
KIRSCH & SATAWA, PC



Examining Forensic Science

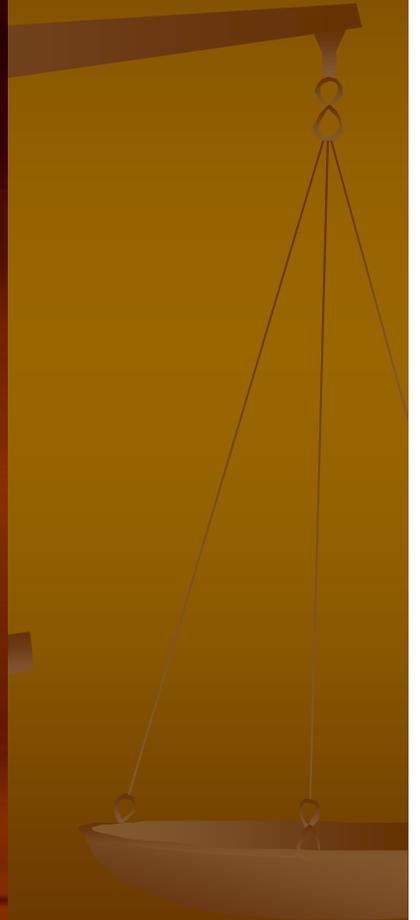




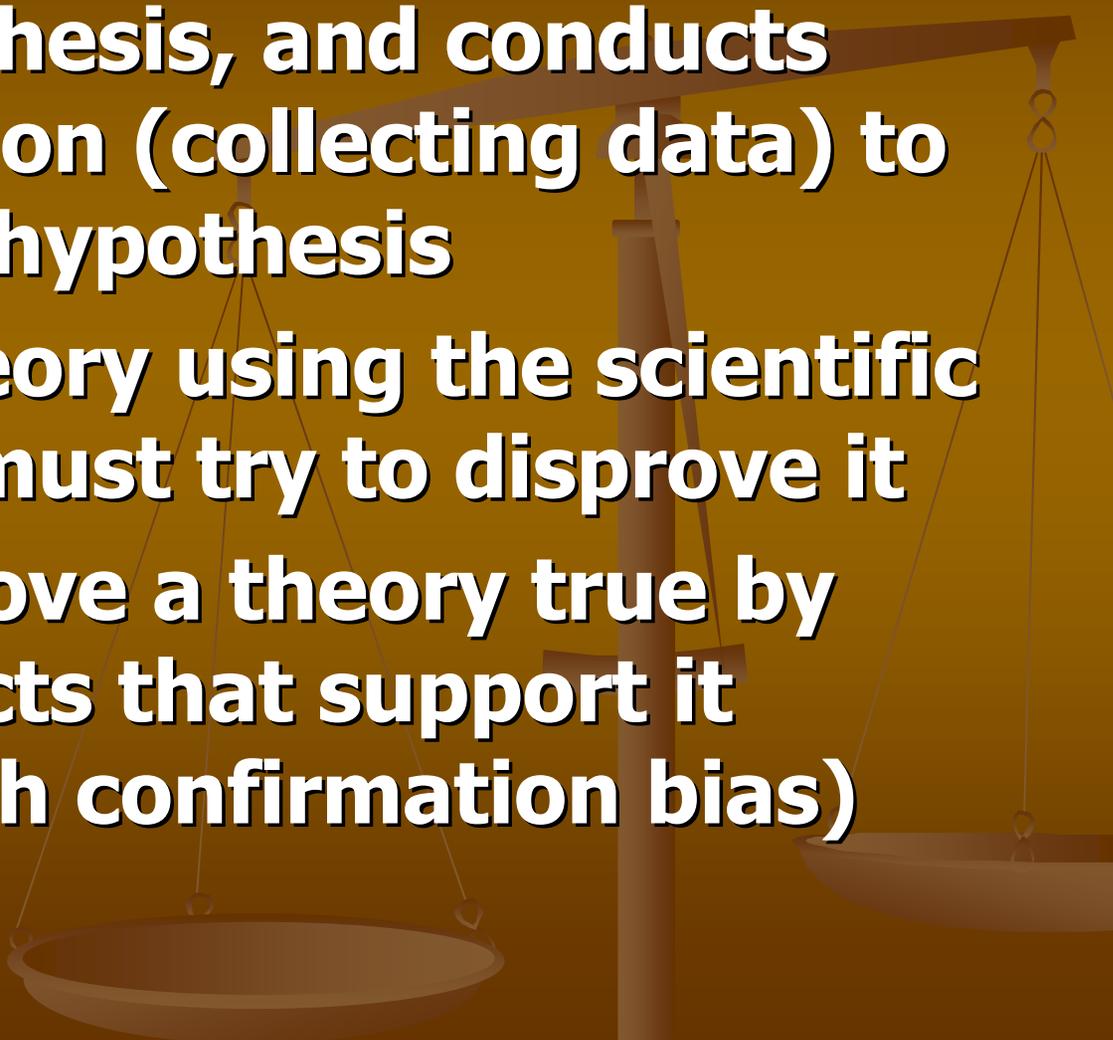
**Take this handkerchief
back to the lab, Stevens.
I want some answers on
who did this. Godzilla?
Gargantua? Who?**

**Forensic
“Science”**

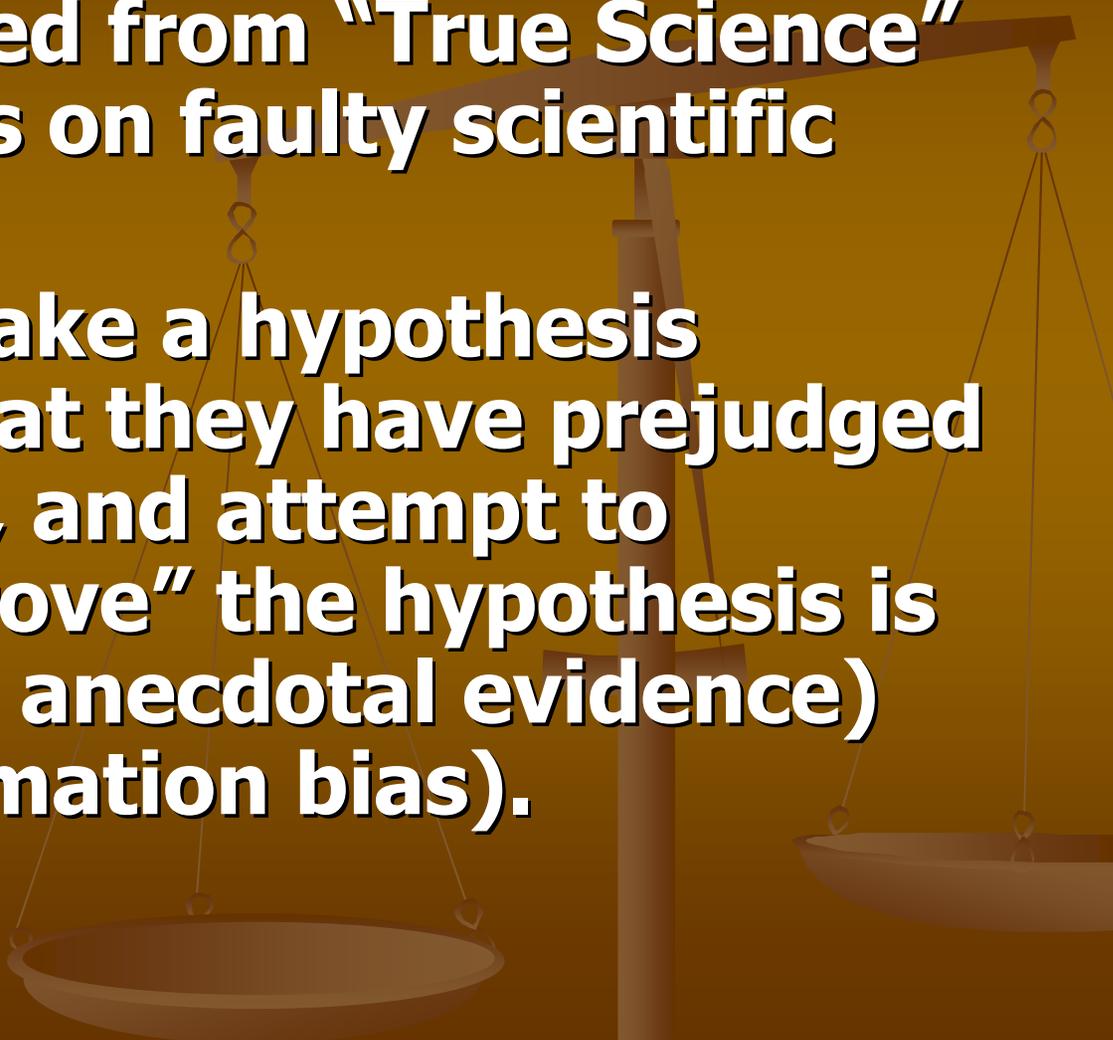
Some Basic Principles of Science



The “True” Scientific Process

- Takes a hypothesis, and conducts experimentation (collecting data) to *disprove* that hypothesis
 - To prove a theory using the scientific process, you must try to disprove it
 - You do not prove a theory true by looking for facts that support it (problems with confirmation bias)
- 

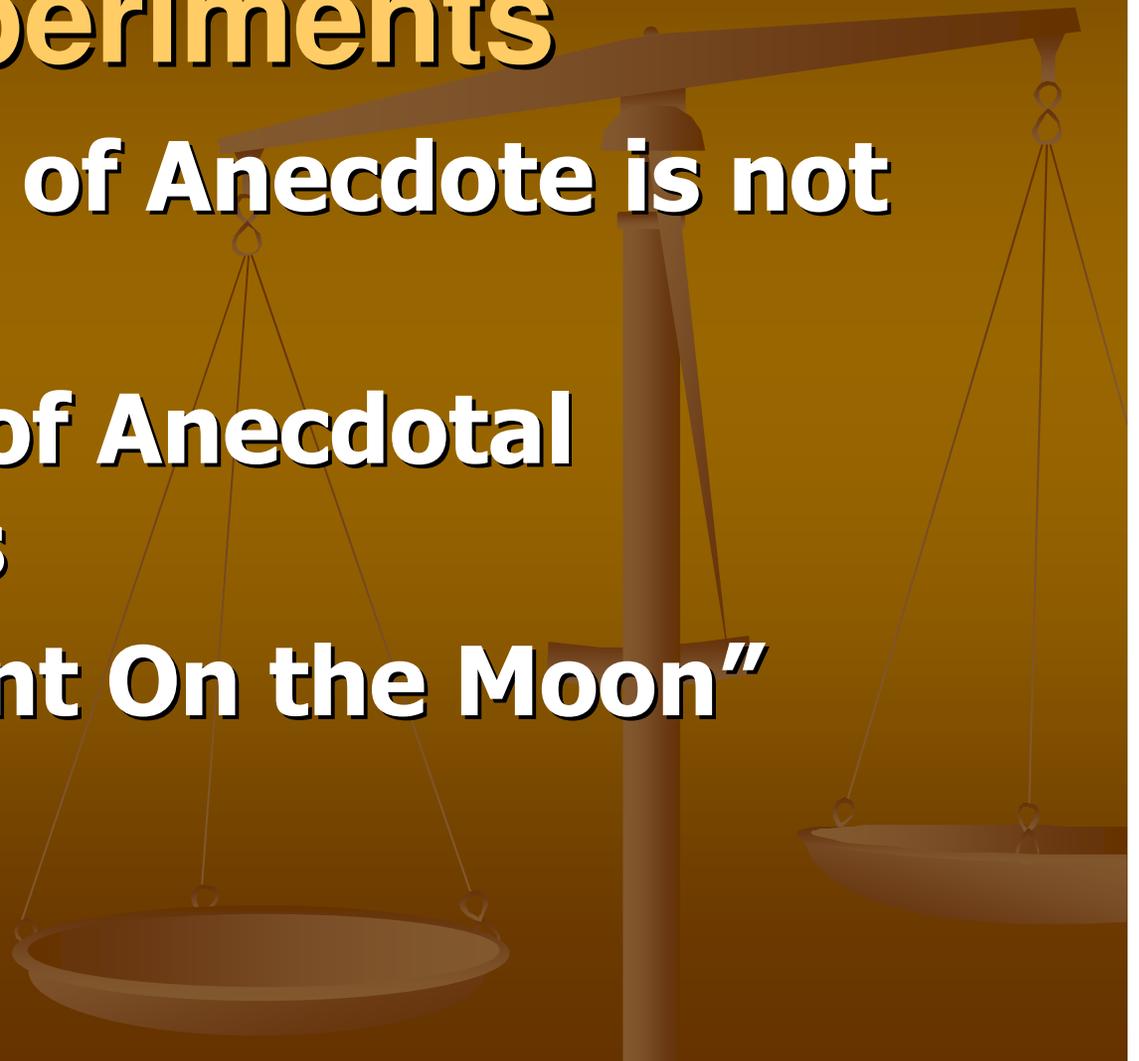
Junk Science



- **Is distinguished from “True Science” in that it relies on faulty scientific methodology**
- **Researchers take a hypothesis (frequently that they have prejudged to be correct), and attempt to confirm or “prove” the hypothesis is correct (using anecdotal evidence) (again, confirmation bias).**

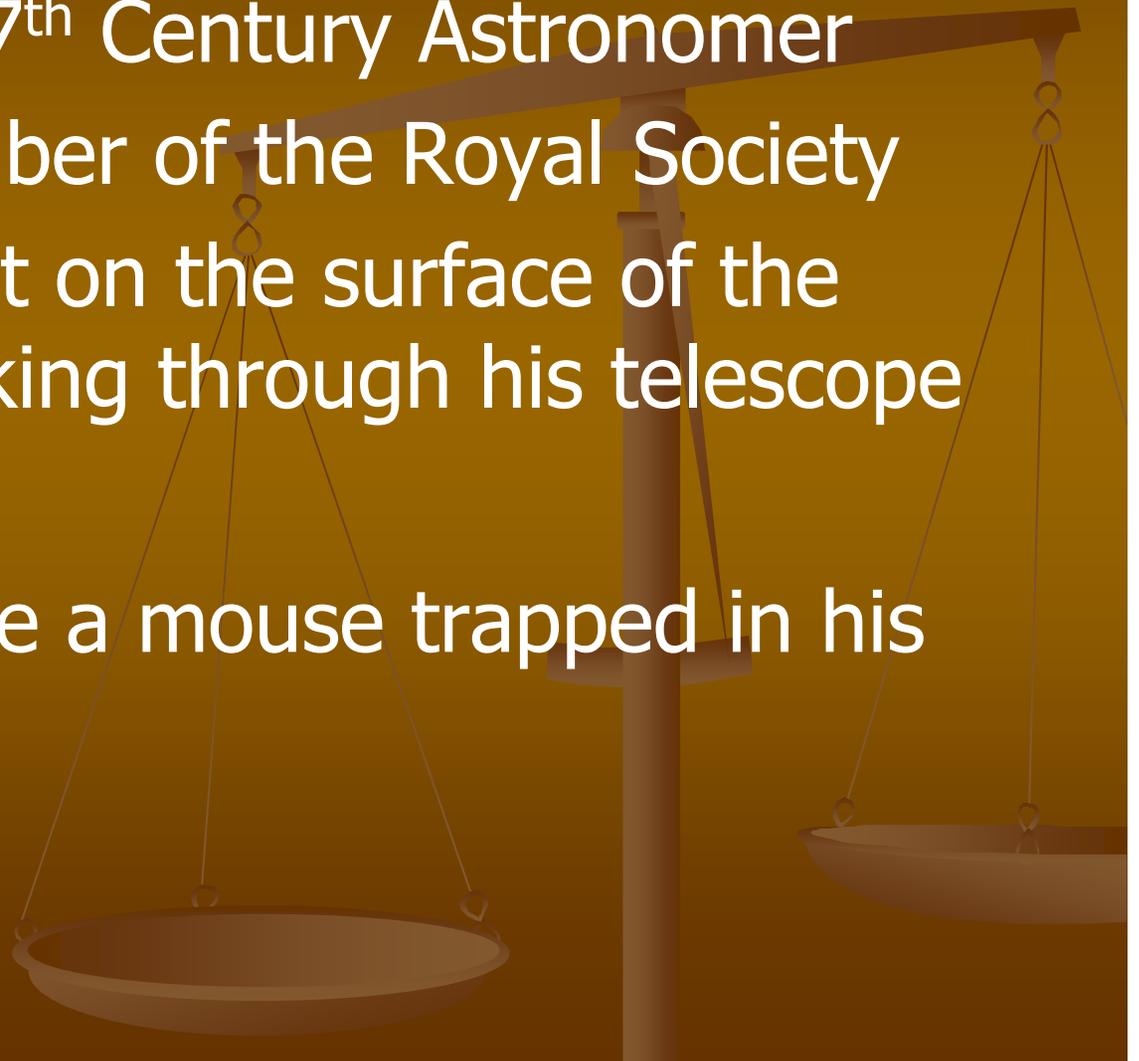
The Danger of Non-Scientific “Anecdotal” Experiments

- **“The Repeat of Anecdote is not Data”**
- **Illustration of Anecdotal Experiments**
- **“The Elephant On the Moon”**



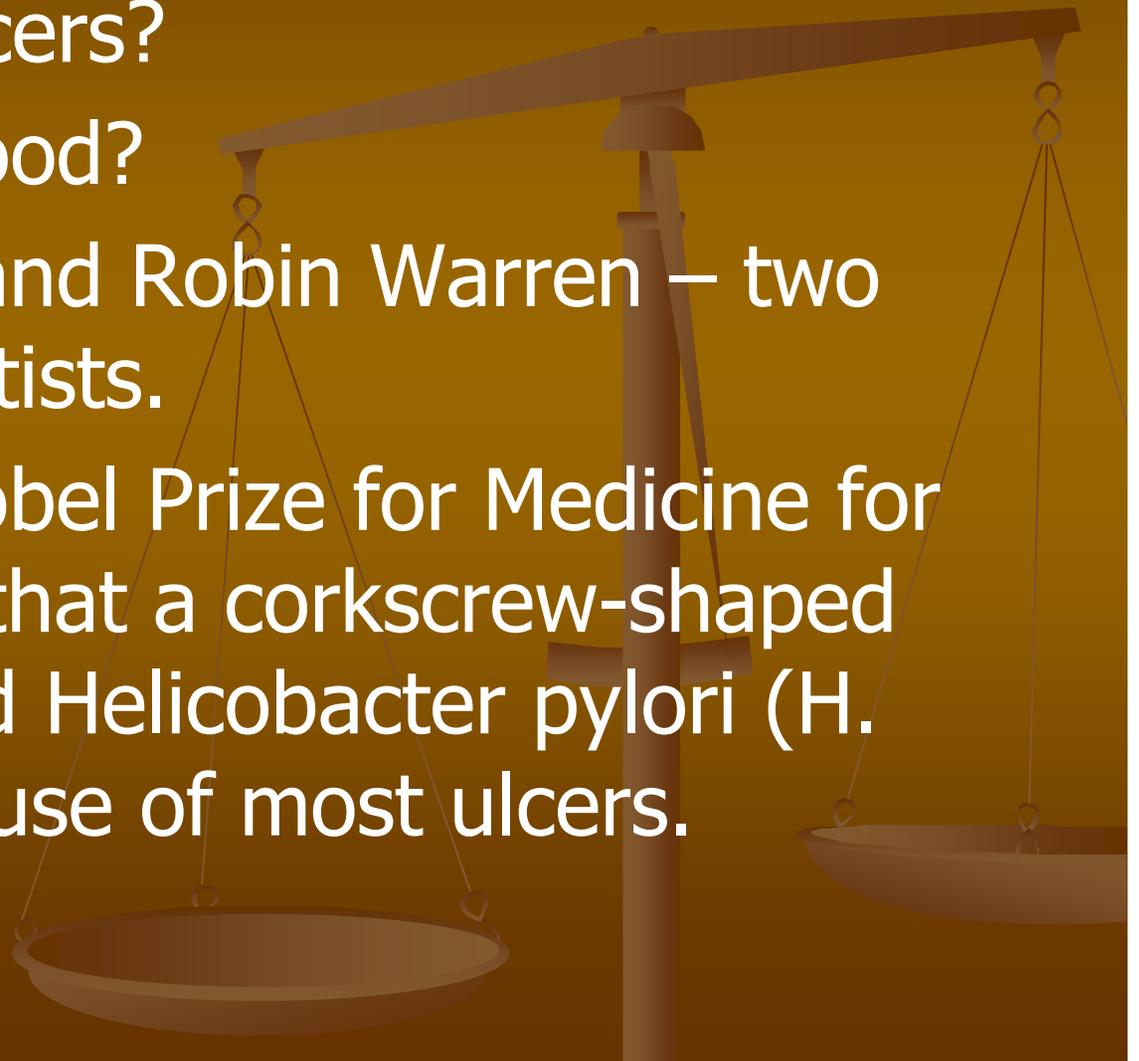
Elephant on the Moon

- Sir Paul Neal, 17th Century Astronomer
- Respected member of the Royal Society
- Saw an elephant on the surface of the moon while looking through his telescope
- BIG NEWS!
- Turned out to be a mouse trapped in his telescope

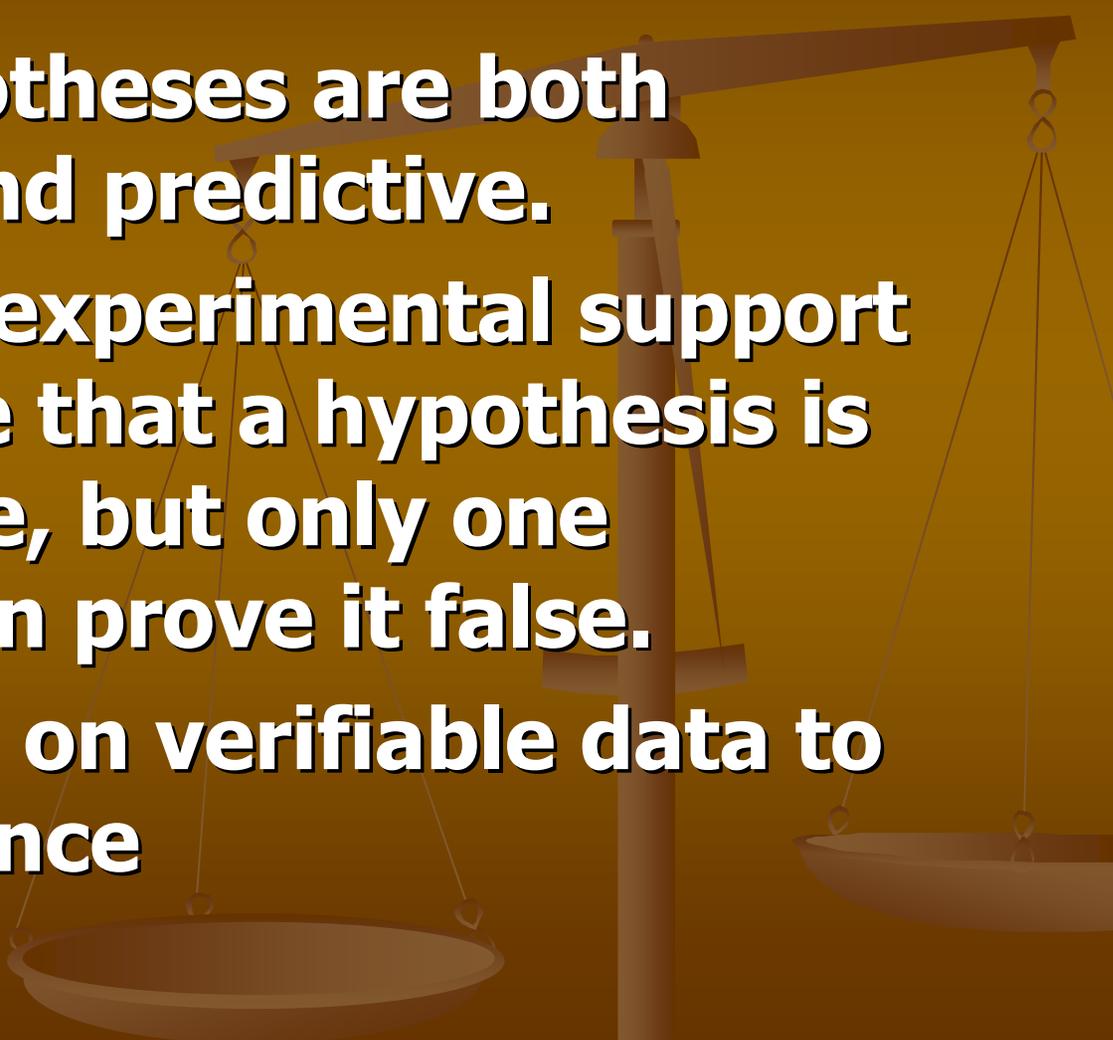


Confirmation bias – never happen today right?

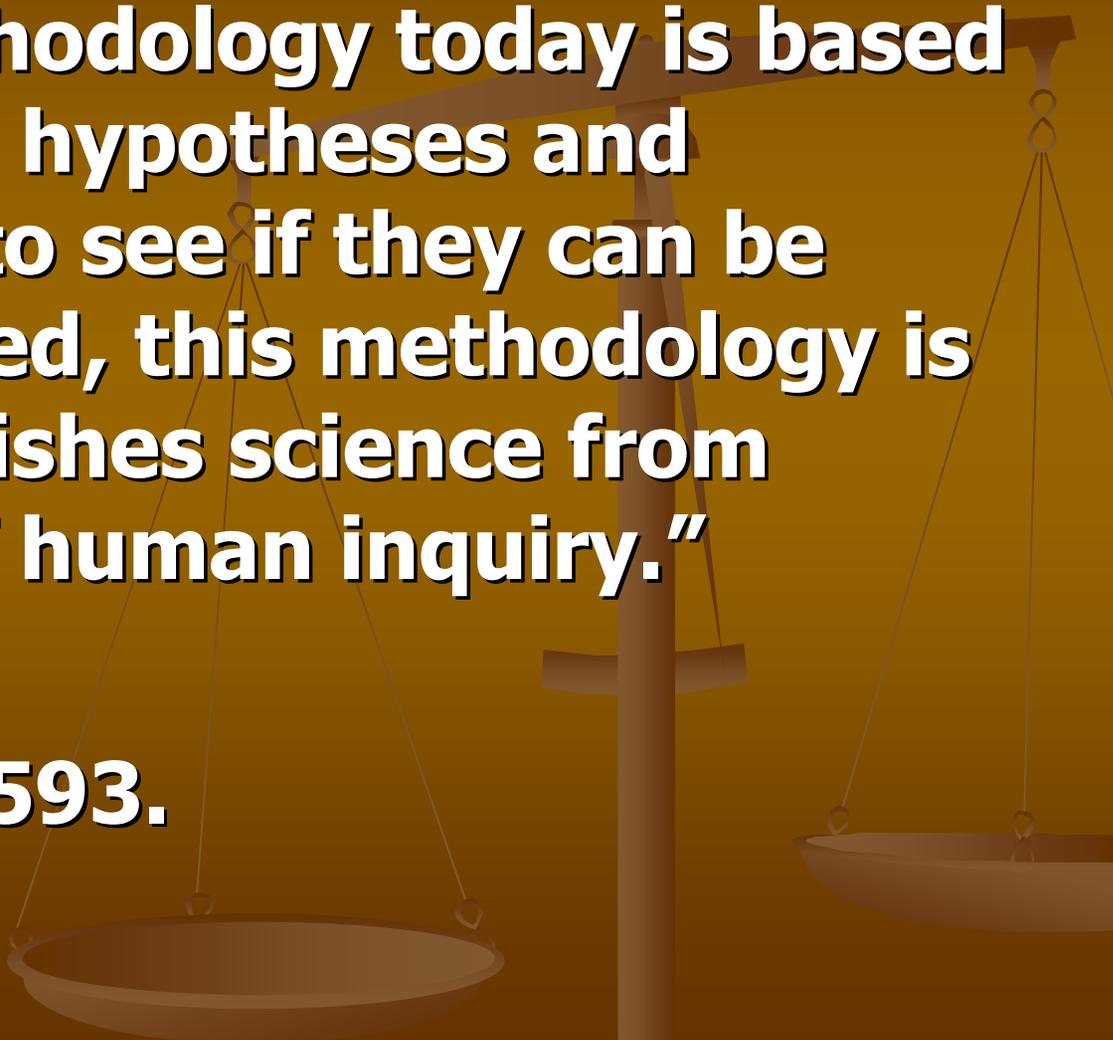
- What causes ulcers?
- Stress? Spicy Food?
- Barry Marshall and Robin Warren – two Australian scientists.
- Awarded the Nobel Prize for Medicine for their discovery that a corkscrew-shaped bacterium called *Helicobacter pylori* (*H. pylori*) is the cause of most ulcers.



Science 101

- **Scientific hypotheses are both explanatory and predictive.**
 - **No amount of experimental support can ever prove that a hypothesis is absolutely true, but only one experiment can prove it false.**
 - **Must be based on verifiable data to show significance**
- 

Daubert v Merrell Dow



“ Scientific methodology today is based on generating hypotheses and testing them to see if they can be *falsified*; indeed, this methodology is what distinguishes science from other fields of human inquiry.”

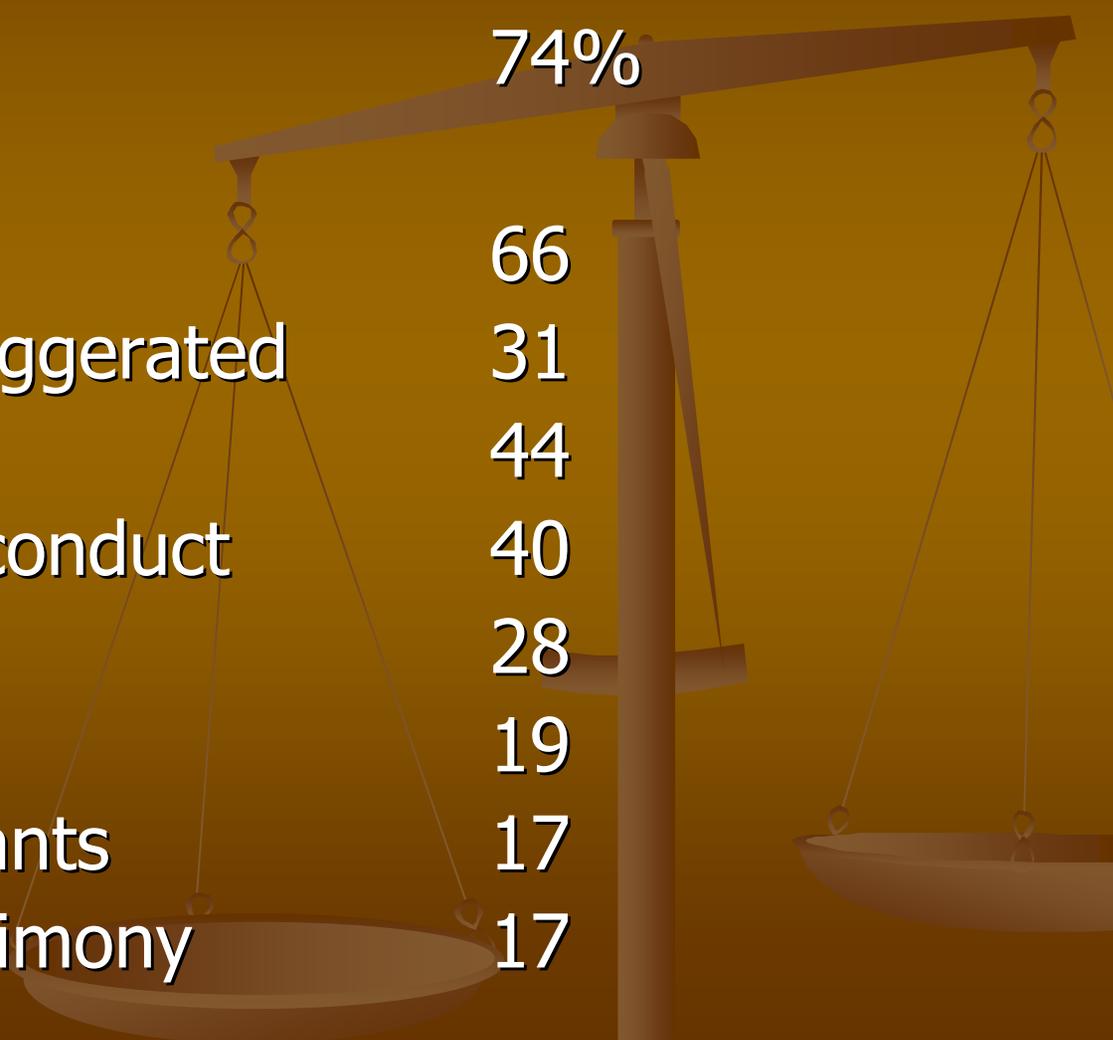
509 US 579, at 593.

Forensic Science



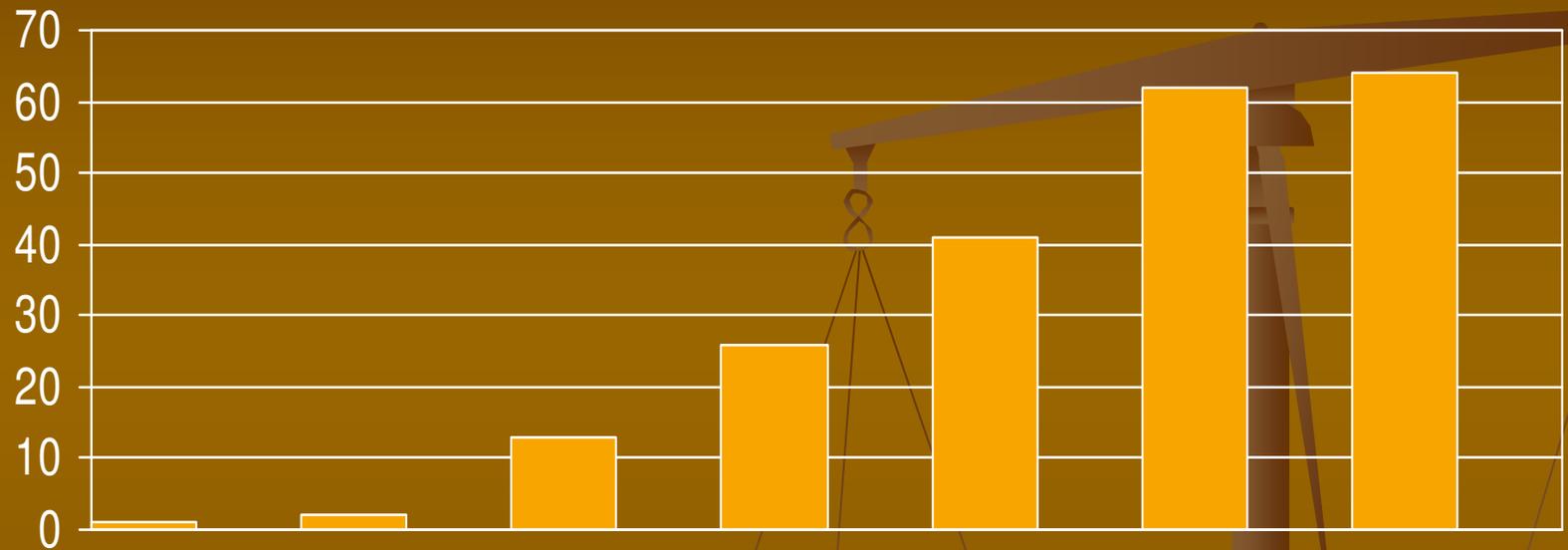
The Problems

Apparent Causes of Erroneous Convictions



■ Eyewitness errors	74%
■ Forensic science	
■ Erroneous	66
■ Fraudulent/Exaggerated	31
■ Police misconduct	44
■ Prosecutorial misconduct	40
■ Bad Lawyering	28
■ False confessions	19
■ Dishonest informants	17
■ False witness testimony	17

Error Rates in Various Forensic Sciences



Firearms

Fingerprints

Toolmarks: Prying

Hair (micro)

Handwriting

Toolmarks: Cutting

Bitemarks

Editor of *Science* (5 Dec 2003)

EDITORIAL

Forensic Science: Oxymoron?

In detective novels and television series, criminals often get caught because they leave fingerprints at the scene. Well, art does imitate life; fingerprint analysis is widely used in U.S. courts and those of many other countries. But last year a funny thing happened to fingerprint evidence on the way to a conviction. Applying the standard set for the admissibility of scientific evidence by the U.S. Supreme Court in the 1993 Daubert case, Judge Louis Pollak ruled that an expert could not testify that the prints at a crime scene matched those of a suspect. Shock reverberated through the criminal justice community until Judge Pollak induced a sigh of relief from district attorneys everywhere by saying that at least in this case, such testimony could be used after all.

The Supreme Court's Daubert standard has generated some ambiguity for the legal community, but the Court did list several criteria for qualifying expert testimony: peer review, error rate, adequate testing, regular standards and techniques, and general acceptance. Judge Pollak's initial finding was that the evidence flunked all but one. Some distinguished legal scholars think that he was right on that call and wrong on the second. The resulting controversy has reignited some old challenges to "forensic science."

It's not that fingerprint analysis is unreliable. The problem, rather, is that its reliability is unverified either by statistical models of fingerprint variation or by consistent data on error rates. Nor does the problem with forensic methods end there. The use of hair samples in identification and the analysis of bullet markings exemplify kinds of "scientific" evidence whose reliability may be exaggerated when presented to a jury. Some criminal defense attorneys have become concerned about the degree to which processing and enhancement of such images could mislead jurors who believe they are seeing undoctored originals. PhotoShop, after all, is everywhere.

Criminal justice agencies have been slow to adopt new scientific procedures and defensive about evaluation of their present ones. The acceptance of DNA evidence and the standardization of laboratory procedures for DNA analysis eventually broke through that barrier, well after there was convincing scientific proof of their reliability. But resistance has remained firm in other areas. For example, polygraph testing for security purposes in the U.S. Department of Energy was carefully evaluated by the National Academies and found to be defective. The department rejected that recommendation and went on testing anyhow. And despite repeated calls for accreditation and oversight, many government crime labs continue to lack either one.

In the United States, the National Academies have a project on Science, Technology, and the Law, in which I'm involved. That group, which had earlier looked at the implications of the Daubert decision and a variety of other issues, was urged to examine science and its uses in forensic examination. A project plan was developed and approved, and one private foundation made a verbal promise of support. The Department of Defense (DOD) and the Department of Justice were also approached for funding, since both have significant programs in this area that make use of forensic techniques. Ending a protracted exchange of correspondence with the Technical Support Working Group in DOD, representing both agencies, the project was dropped because the government insisted on rights of review that the Academies have, at least in the recent past, refused to grant a sponsor. And months after the foundation grant had been offered, it was withdrawn.

The Department of Justice, where the Federal Bureau of Investigation operates perhaps the most sophisticated crime laboratory in the country, is the home of the National Institute of Justice (NIJ). NIJ supports an annual Conference on Science and the Law, in which the American Association for the Advancement of Science and the Academies participate. In planning the agenda for these conferences, NIJ has regularly resisted including comprehensive evaluations of the science underlying forensic techniques.

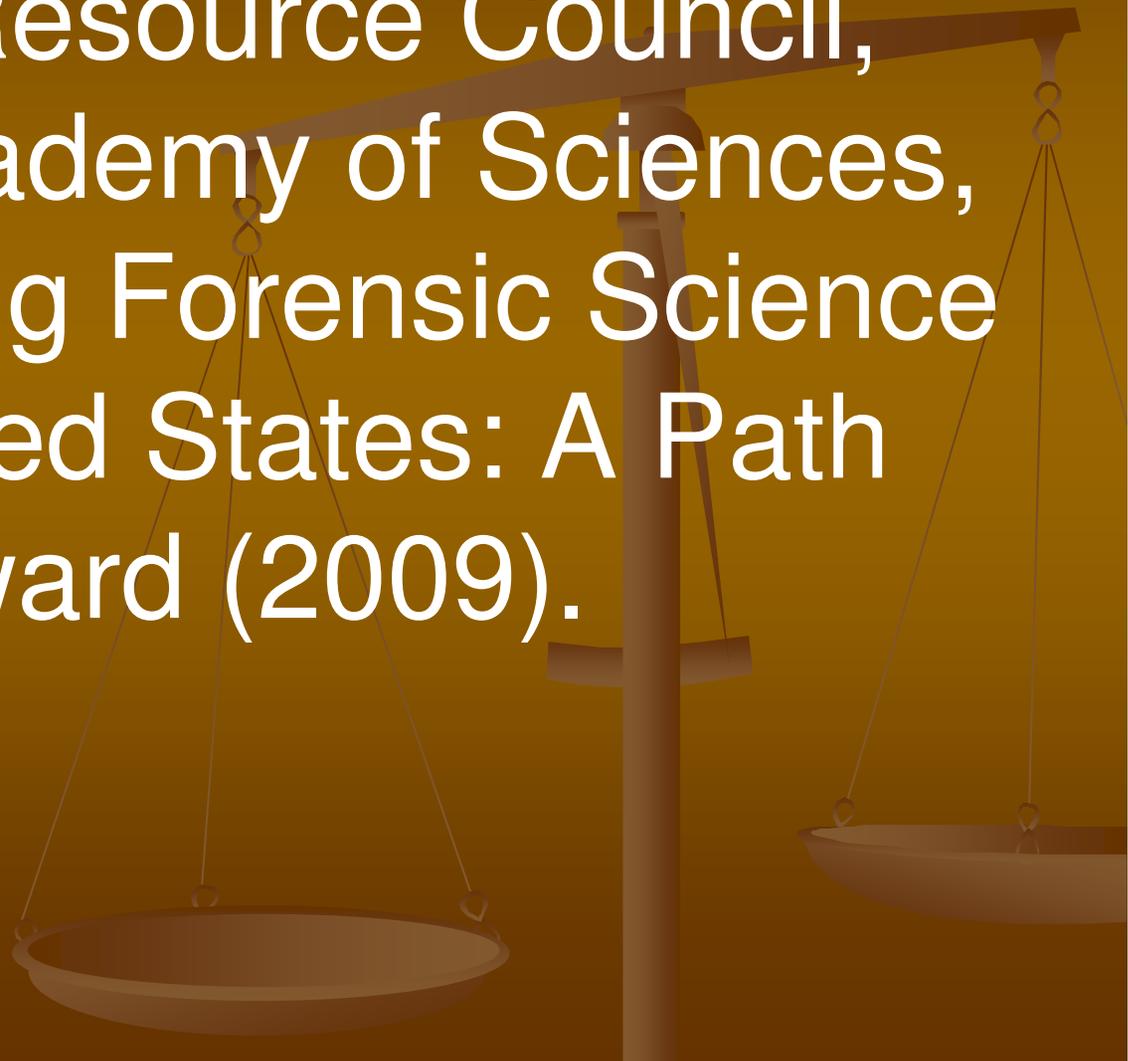
One would have thought that the issues surrounding homeland security would have increased the government's desire to apply better science to the detection of criminal activity and the pursuit of perpetrators. And of course our society has a long-standing concern about protecting the rights of the accused. Both these public interests—security and justice—would be furthered by a more scientific and reliable technology for analyzing crimes. The mystery here is why the practitioners don't seem to want it!

Donald Kennedy
Editor-in-Chief



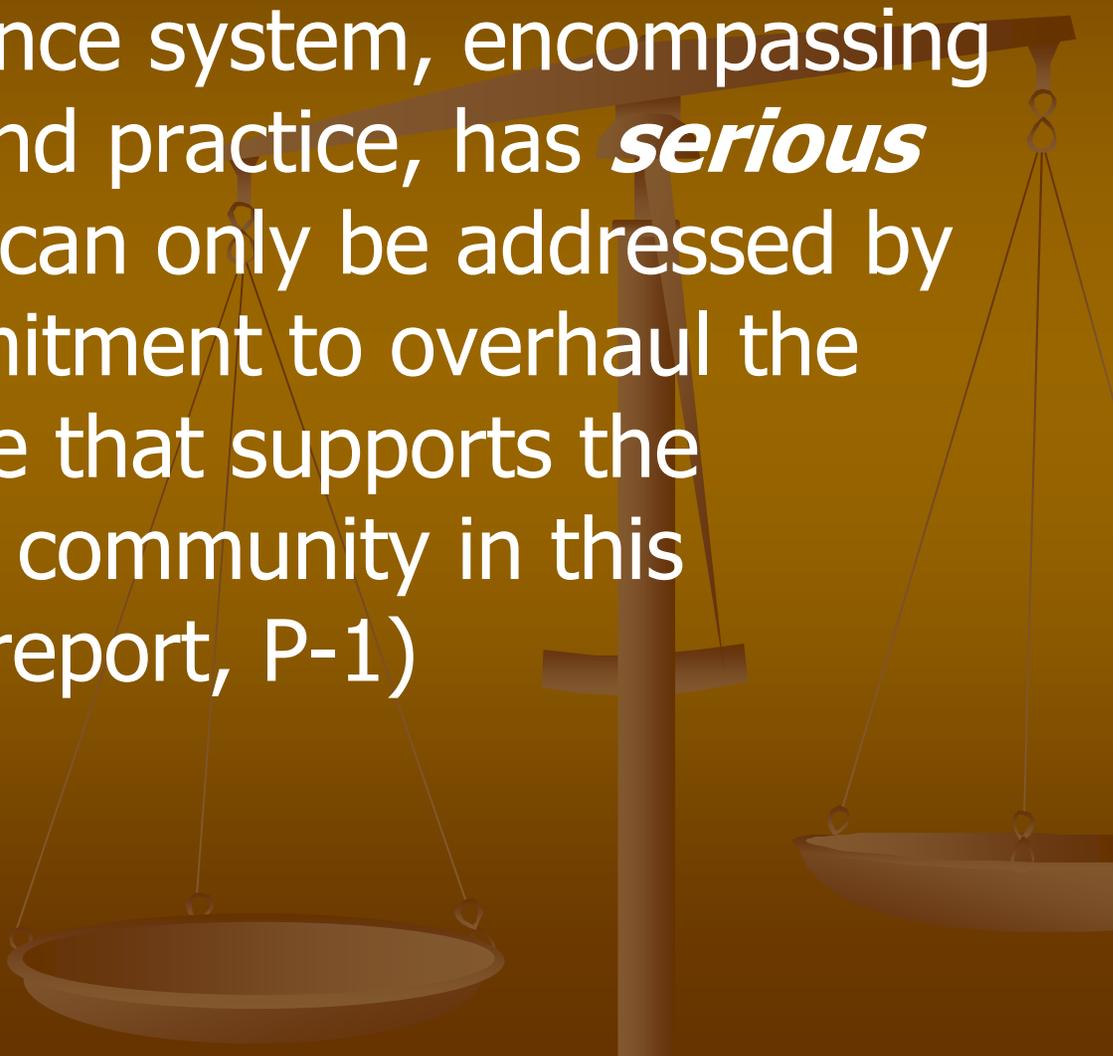
PHOTO: SHUTTERSTOCK

National Resource Council,
National Academy of Sciences,
Strengthening Forensic Science
in the United States: A Path
Forward (2009).



NAS Report – Page 1 of the Preface!

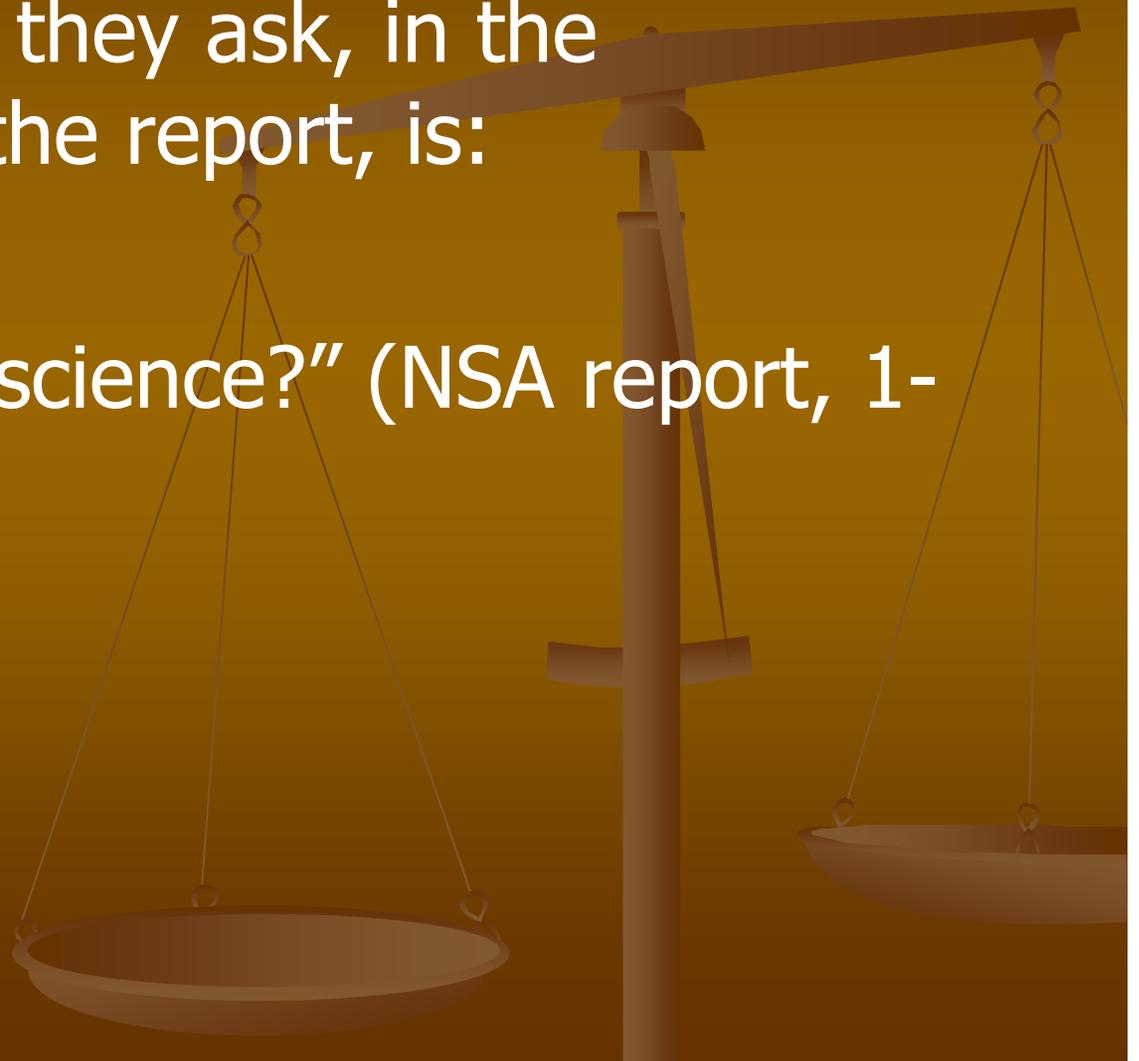
“The forensic science system, encompassing both research and practice, has *serious problems* that can only be addressed by a national commitment to overhaul the current structure that supports the forensic science community in this country.” (NSA report, P-1)



NSA Report

The first question they ask, in the introduction of the report, is:

“What is forensic science?” (NSA report, 1-3)

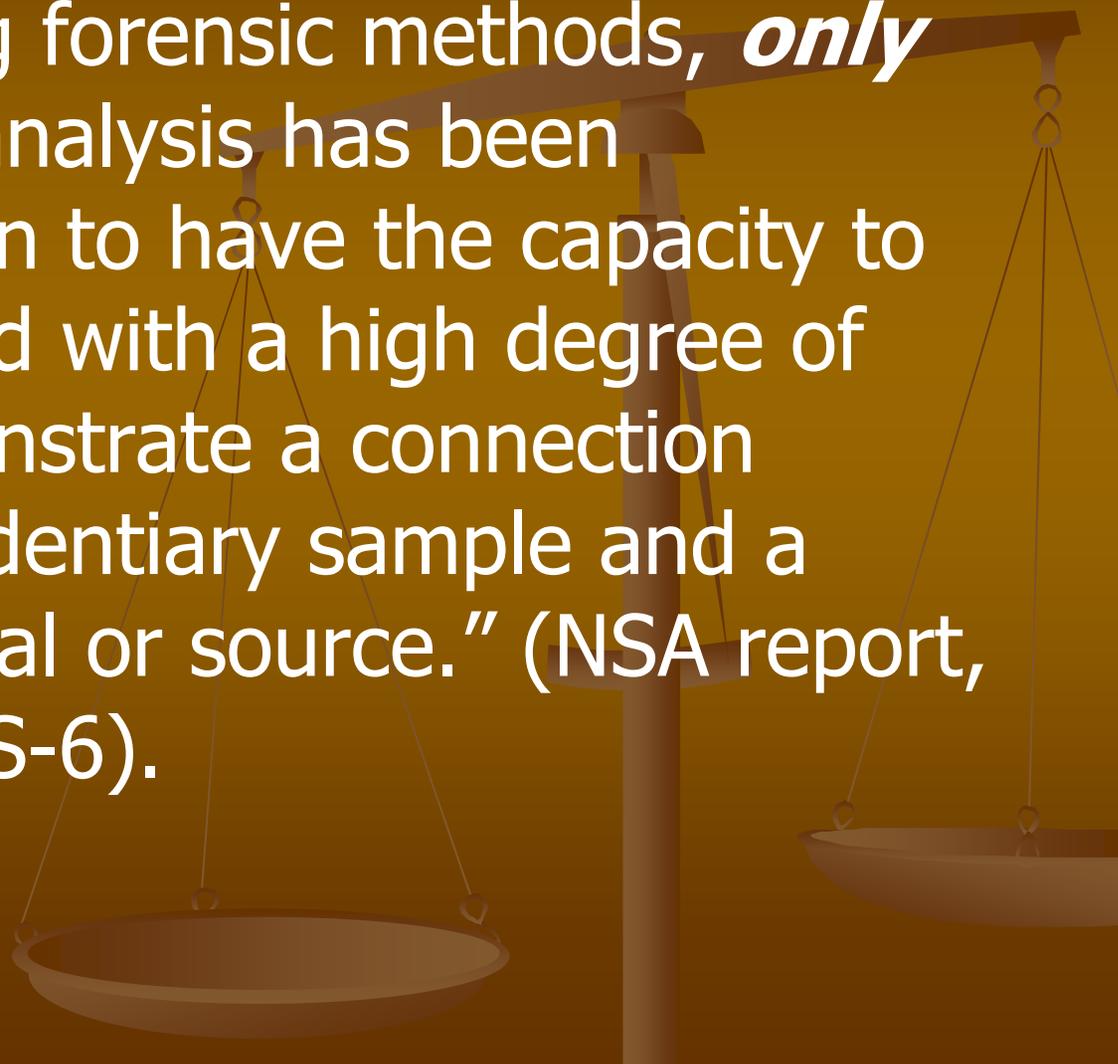


Importantly, the NSA report was critical of “exaggerated” forensic expert testimony – which included claims of perfect accuracy, infallibility, or zero error rate.



NSA Report Findings

- “Among existing forensic methods, ***only nuclear DNA*** analysis has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between an evidentiary sample and a specific individual or source.” (NSA report, 3-2, 3-12, S-5, S-6).



Forensic Evidence – the problems?

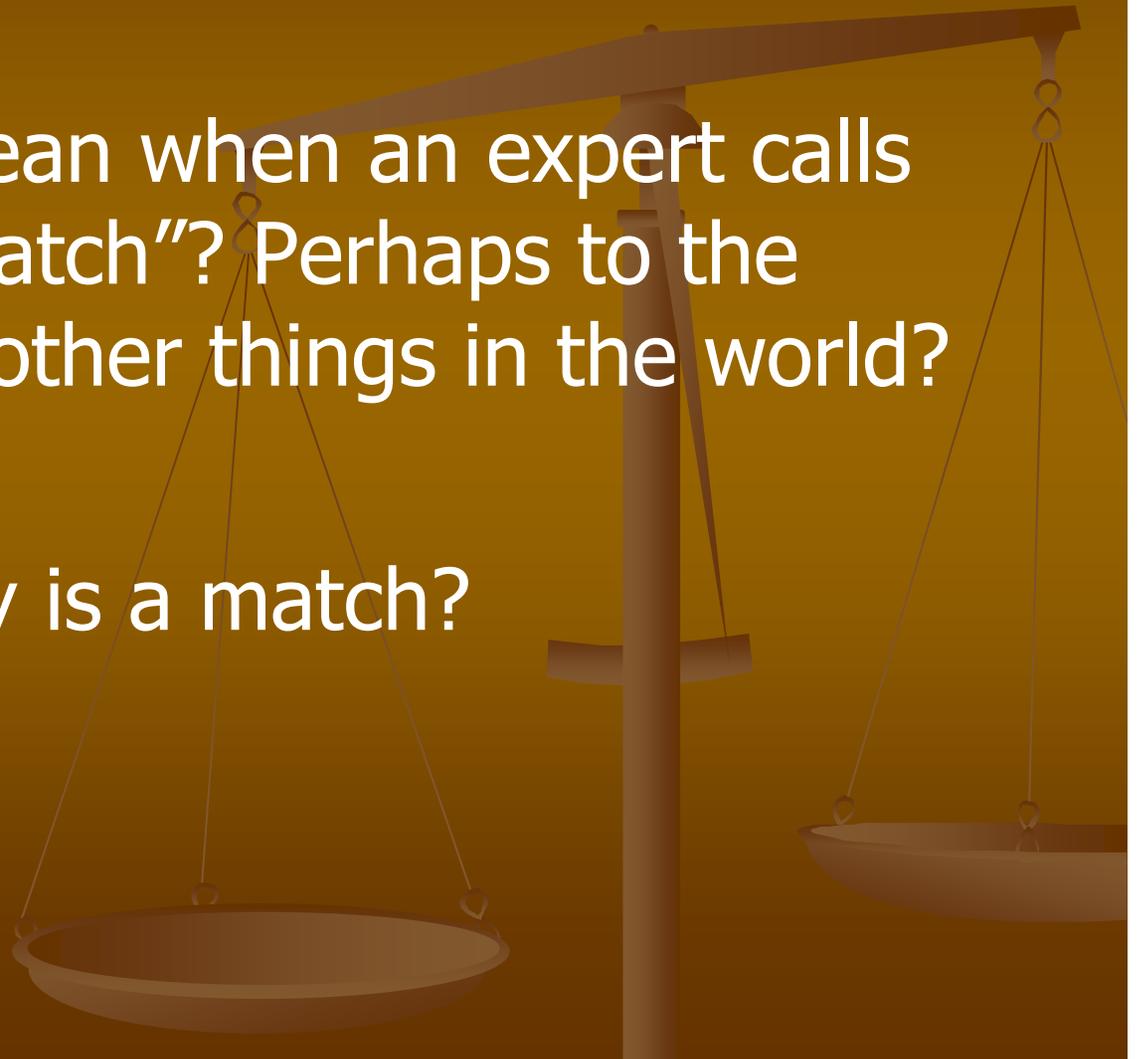
Again, from NSA report:

- claims of perfect accuracy;
- claims of infallibility; and
- claims of zero error rate.



“Perfect accuracy”

- What does it mean when an expert calls something a “Match”? Perhaps to the exclusion of all other things in the world?
- Or, what exactly is a match?

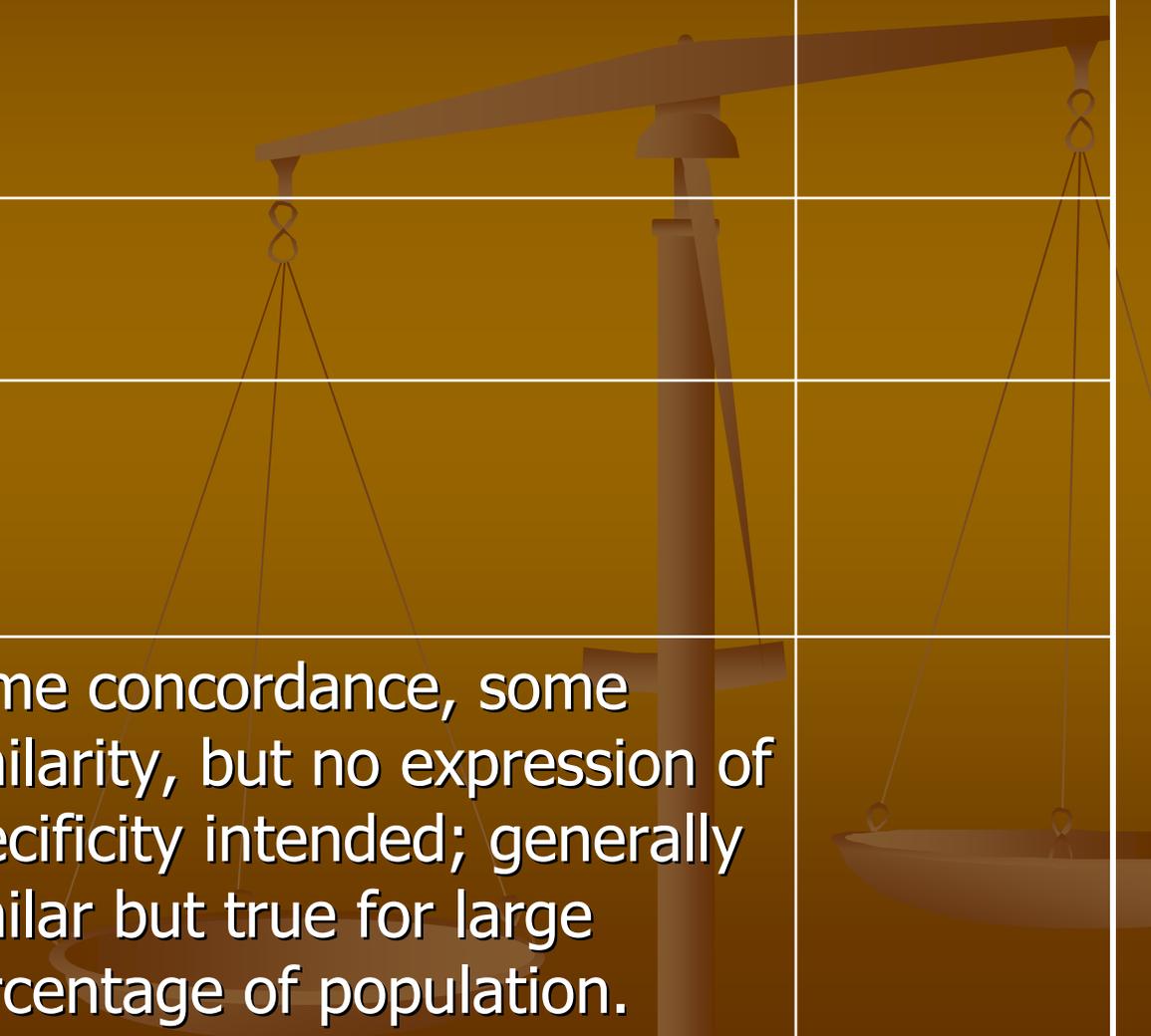


ABFO Terminology – “Matches”

Testimony	Official Definition	Rating
Reasonable scientific certainty		
Probable		
Consistent (with)		
Match		

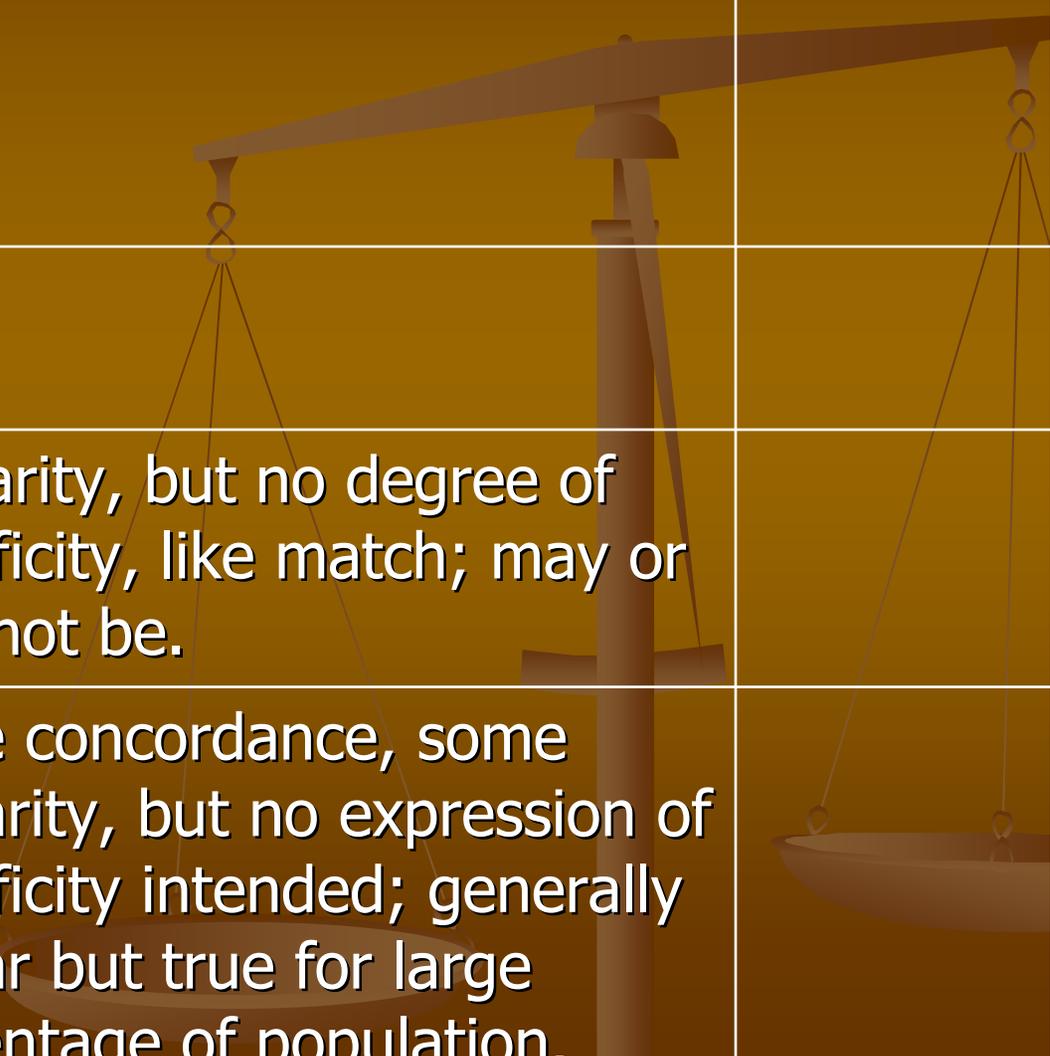


ABFO Terminology



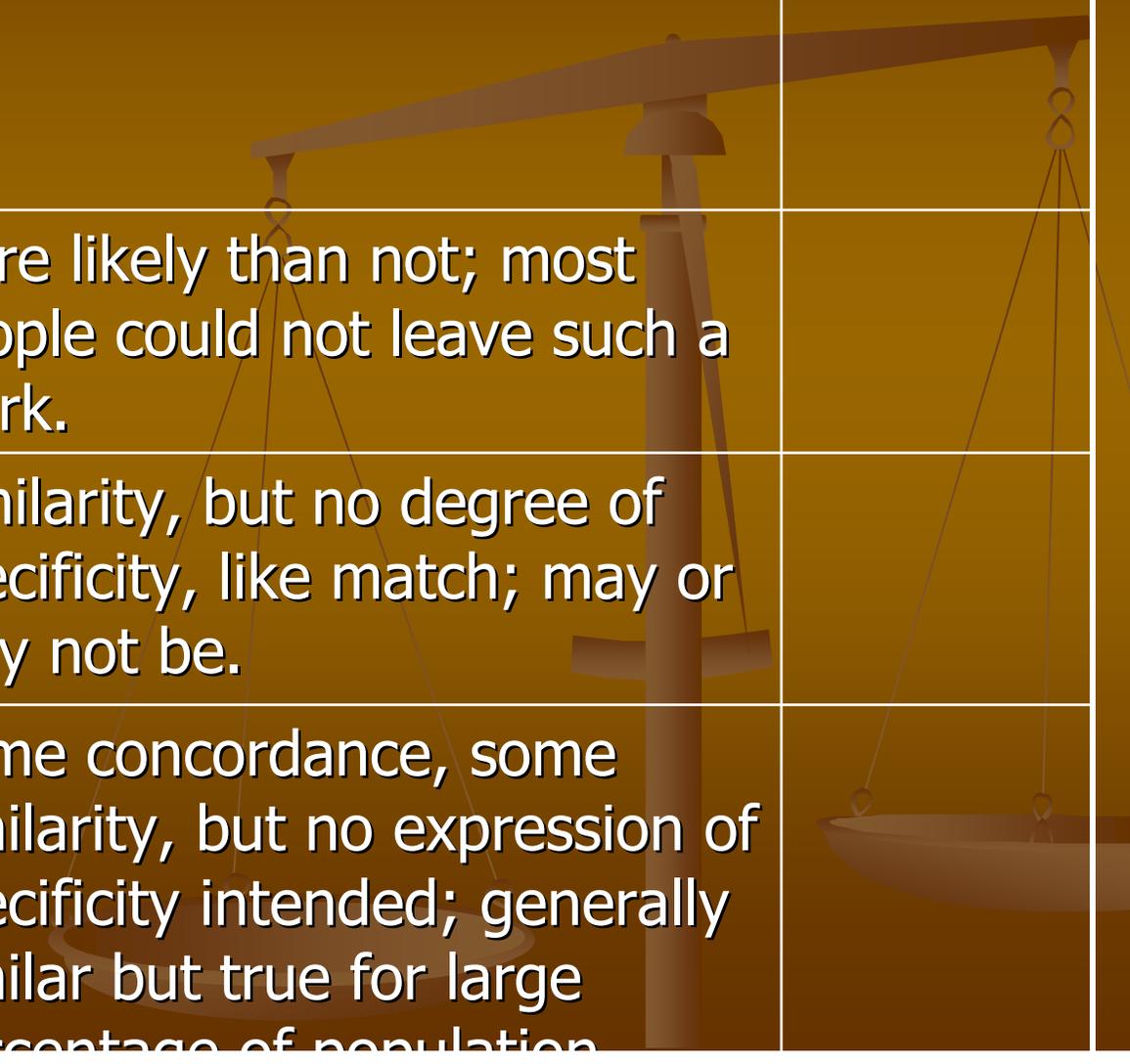
Testimony	Official Definition	Rating
Reasonable scientific certainty		
Probable		
Consistent (with)		
Match	Some concordance, some similarity, but no expression of specificity intended; generally similar but true for large percentage of population.	

ABFO Terminology



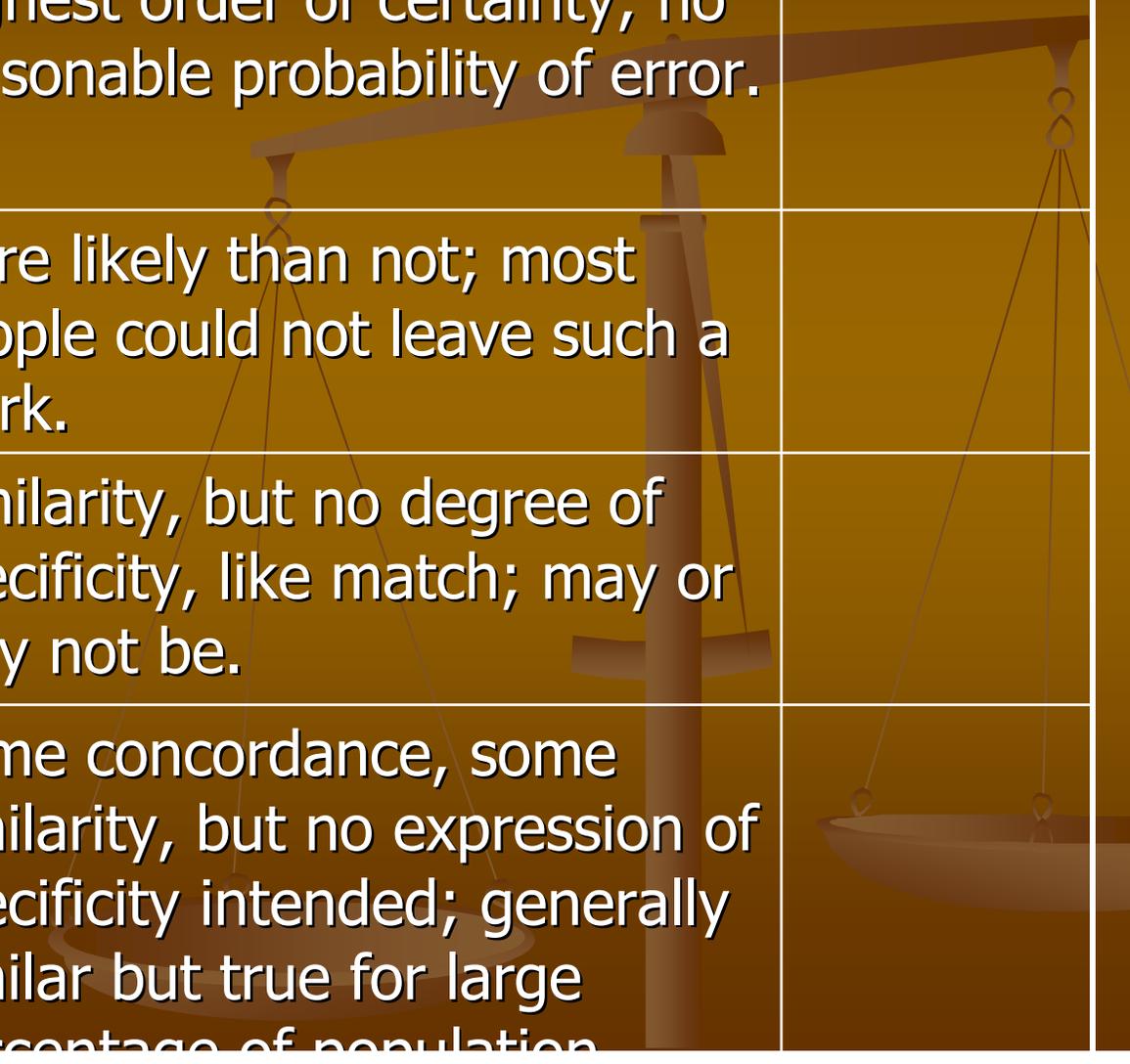
Testimony	Official Definition	Rating
Reasonable scientific certainty		
Probable		
Consistent (with)	Similarity, but no degree of specificity, like match; may or may not be.	
Match	Some concordance, some similarity, but no expression of specificity intended; generally similar but true for large percentage of population.	

ABFO Terminology



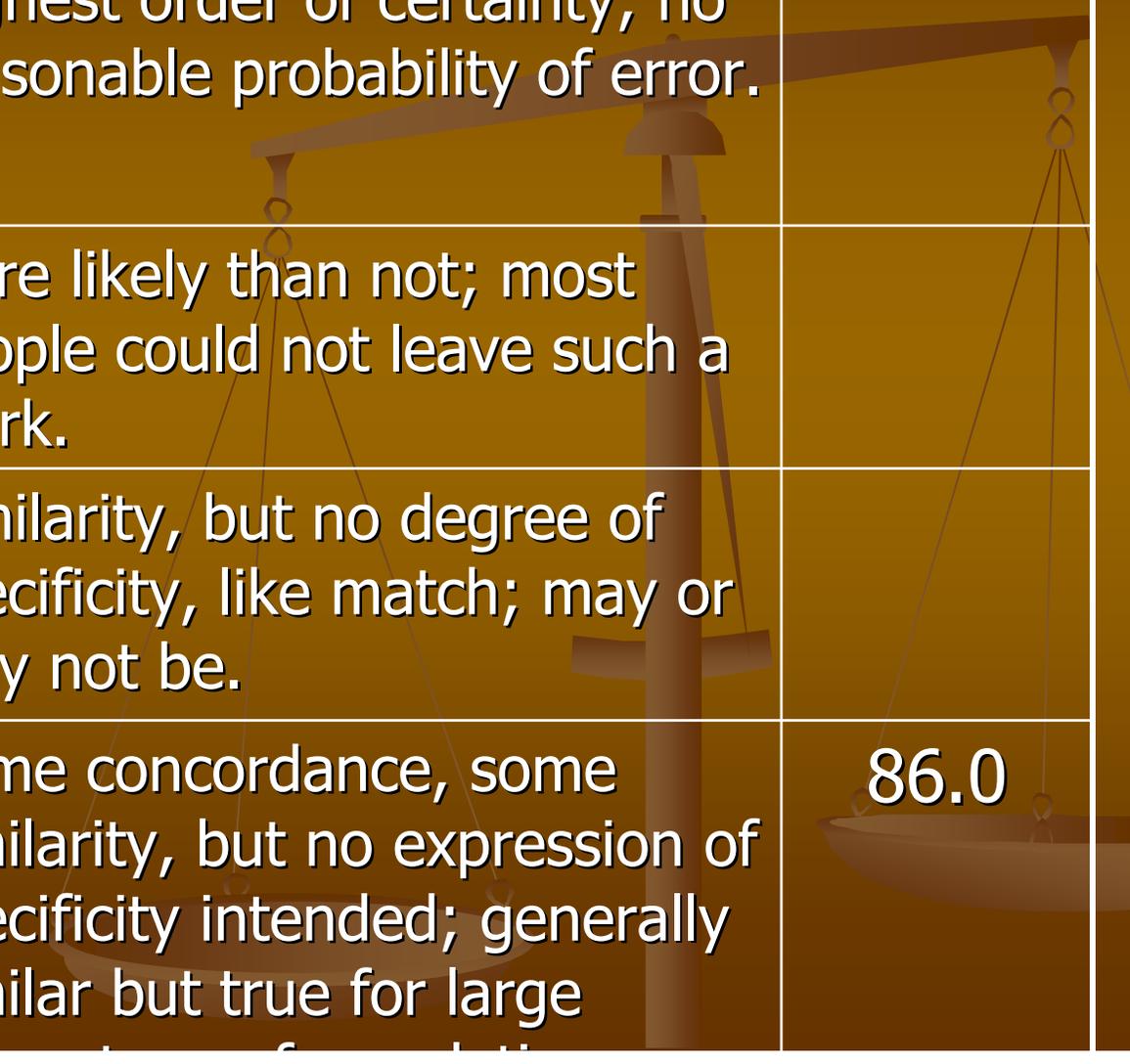
Testimony	Official Definition	Rating
Reasonable scientific certainty		
Probable	More likely than not; most people could not leave such a mark.	
Consistent (with)	Similarity, but no degree of specificity, like match; may or may not be.	
Match	Some concordance, some similarity, but no expression of specificity intended; generally similar but true for large percentage of population	

ABFO Terminology



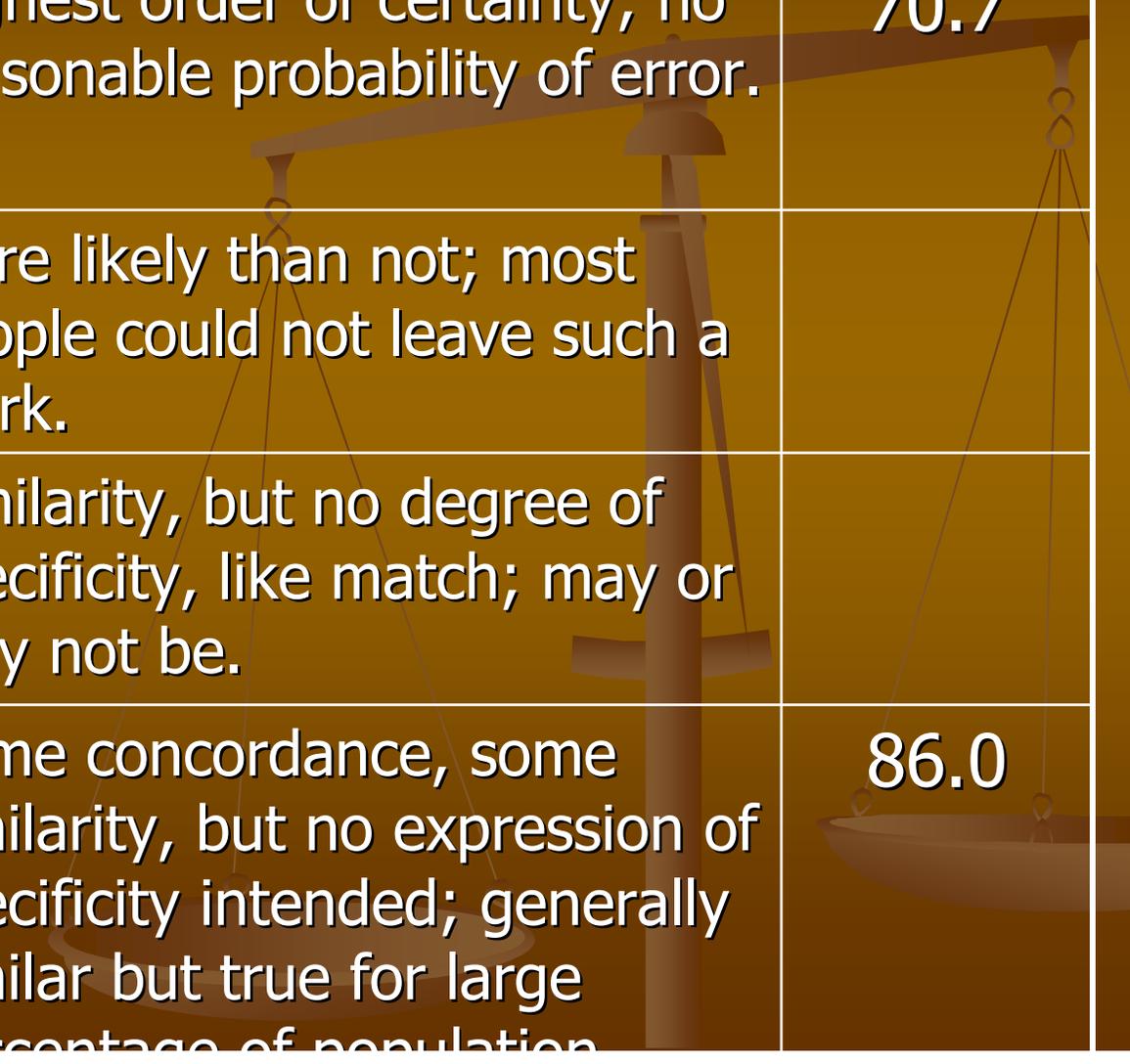
Testimony	Official Definition	Rating
Reasonable scientific certainty	Highest order of certainty; no reasonable probability of error.	
Probable	More likely than not; most people could not leave such a mark.	
Consistent (with)	Similarity, but no degree of specificity, like match; may or may not be.	
Match	Some concordance, some similarity, but no expression of specificity intended; generally similar but true for large percentage of population	

ABFO Terminology



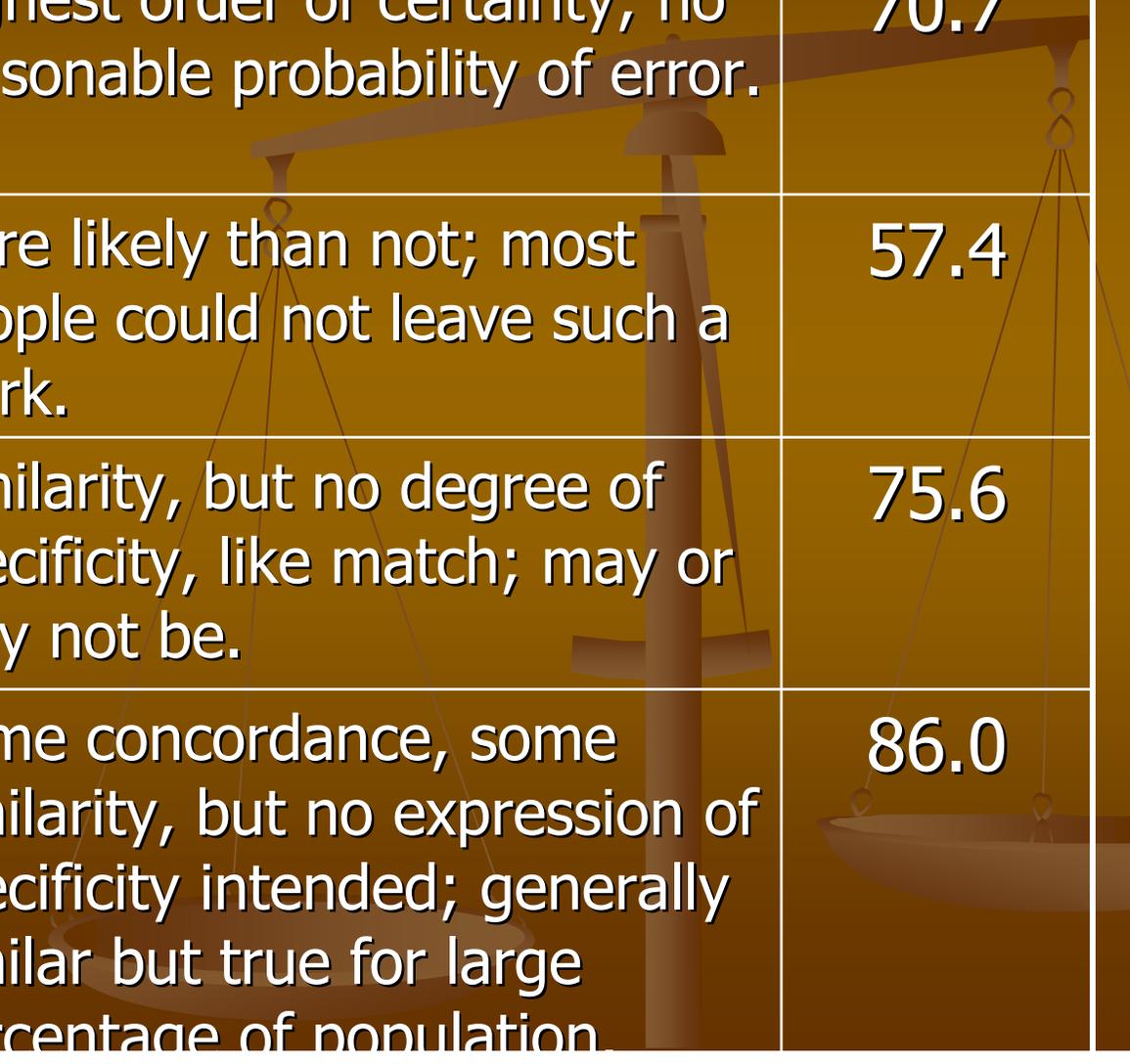
Testimony	Official Definition	Rating
Reasonable scientific certainty	Highest order of certainty; no reasonable probability of error.	
Probable	More likely than not; most people could not leave such a mark.	
Consistent (with)	Similarity, but no degree of specificity, like match; may or may not be.	
Match	Some concordance, some similarity, but no expression of specificity intended; generally similar but true for large	86.0

ABFO Terminology



Testimony	Official Definition	Rating
Reasonable scientific certainty	Highest order of certainty; no reasonable probability of error.	70.7
Probable	More likely than not; most people could not leave such a mark.	
Consistent (with)	Similarity, but no degree of specificity, like match; may or may not be.	
Match	Some concordance, some similarity, but no expression of specificity intended; generally similar but true for large percentage of population	86.0

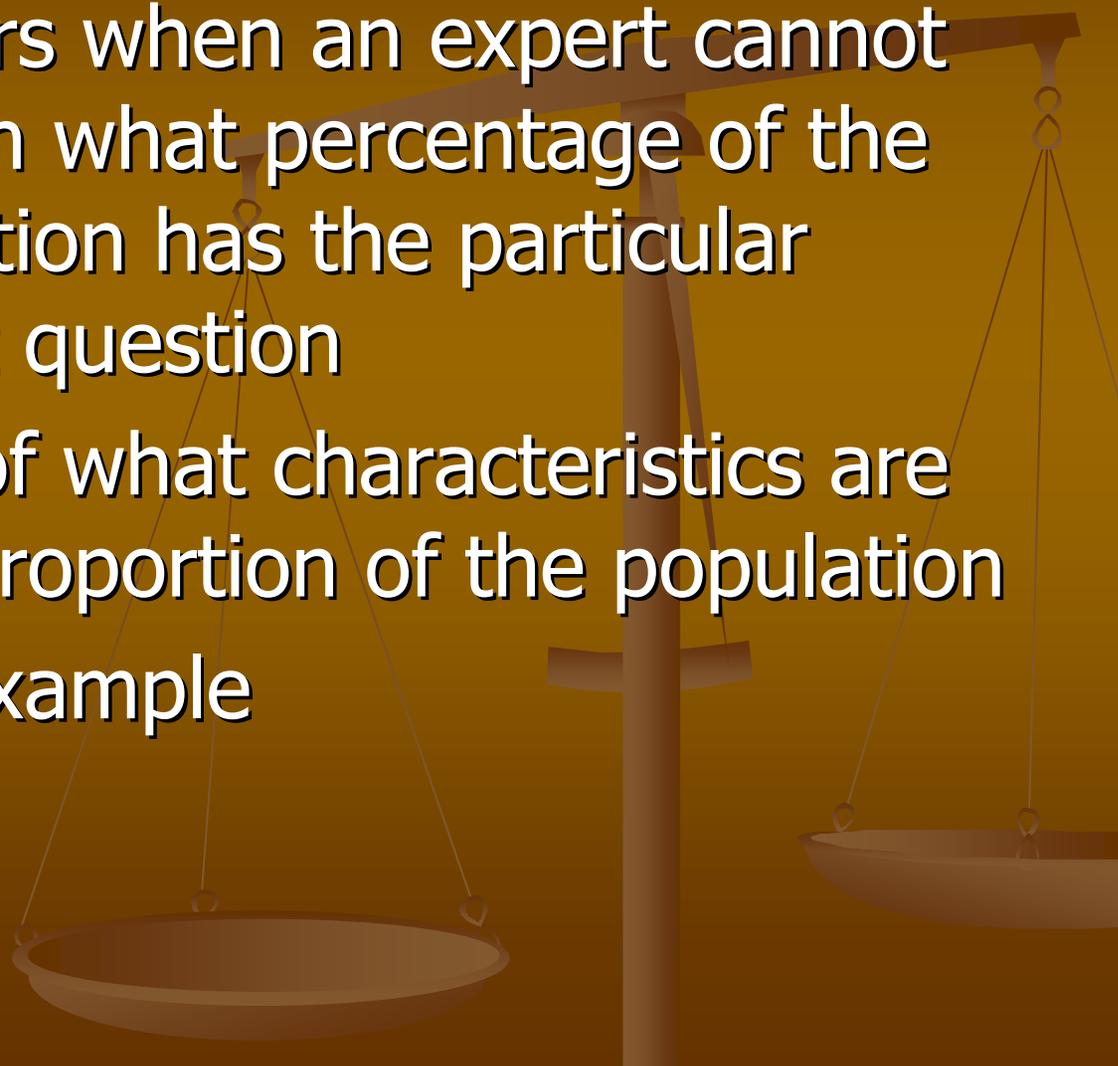
ABFO Terminology

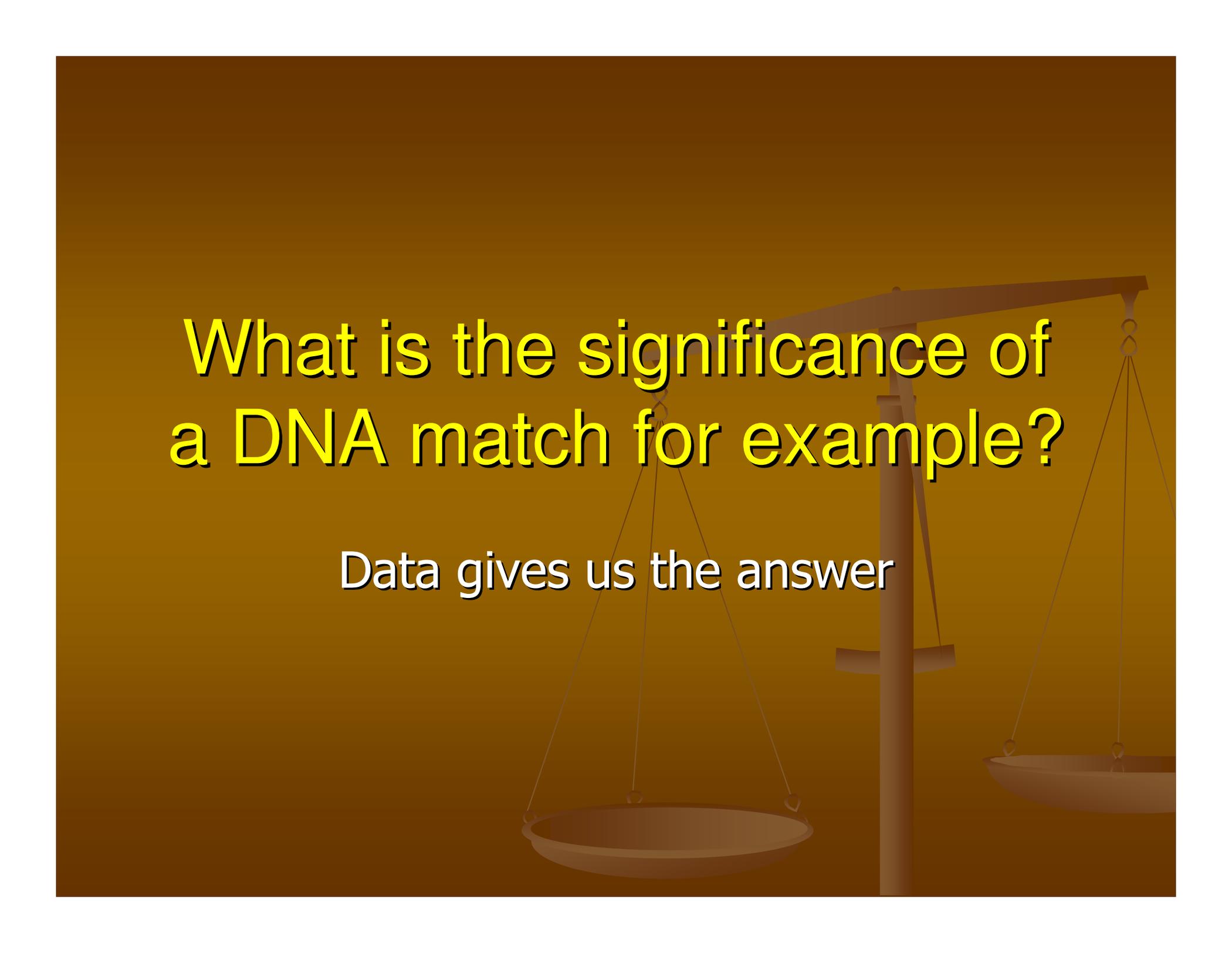


Testimony	Official Definition	Rating
Reasonable scientific certainty	Highest order of certainty; no reasonable probability of error.	70.7
Probable	More likely than not; most people could not leave such a mark.	57.4
Consistent (with)	Similarity, but no degree of specificity, like match; may or may not be.	75.6
Match	Some concordance, some similarity, but no expression of specificity intended; generally similar but true for large percentage of population.	86.0

A Science without Data

- A problem occurs when an expert cannot give statistics on what percentage of the relevant population has the particular characteristic at question
- No knowledge of what characteristics are found in what proportion of the population
- Take DNA for Example



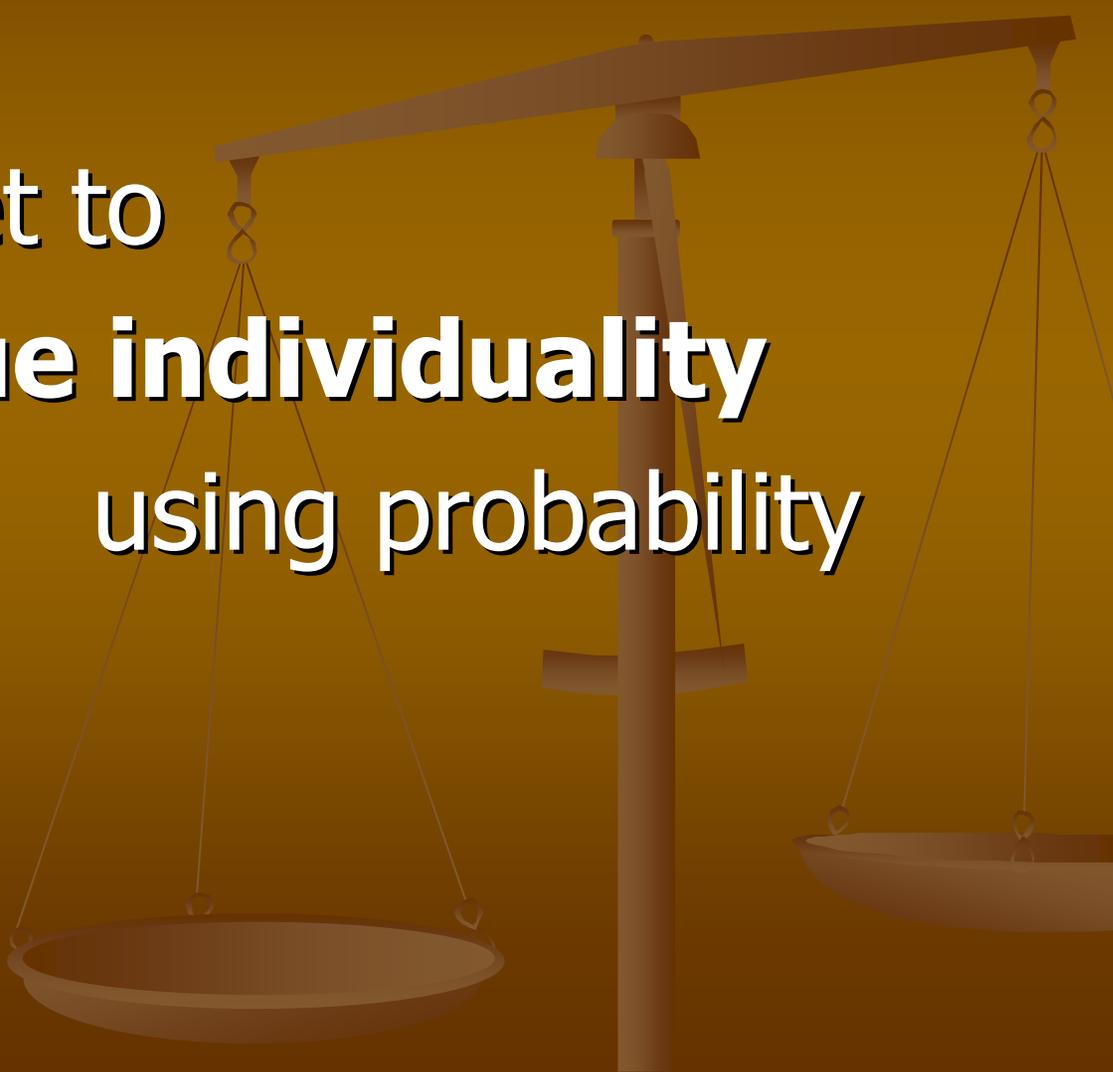


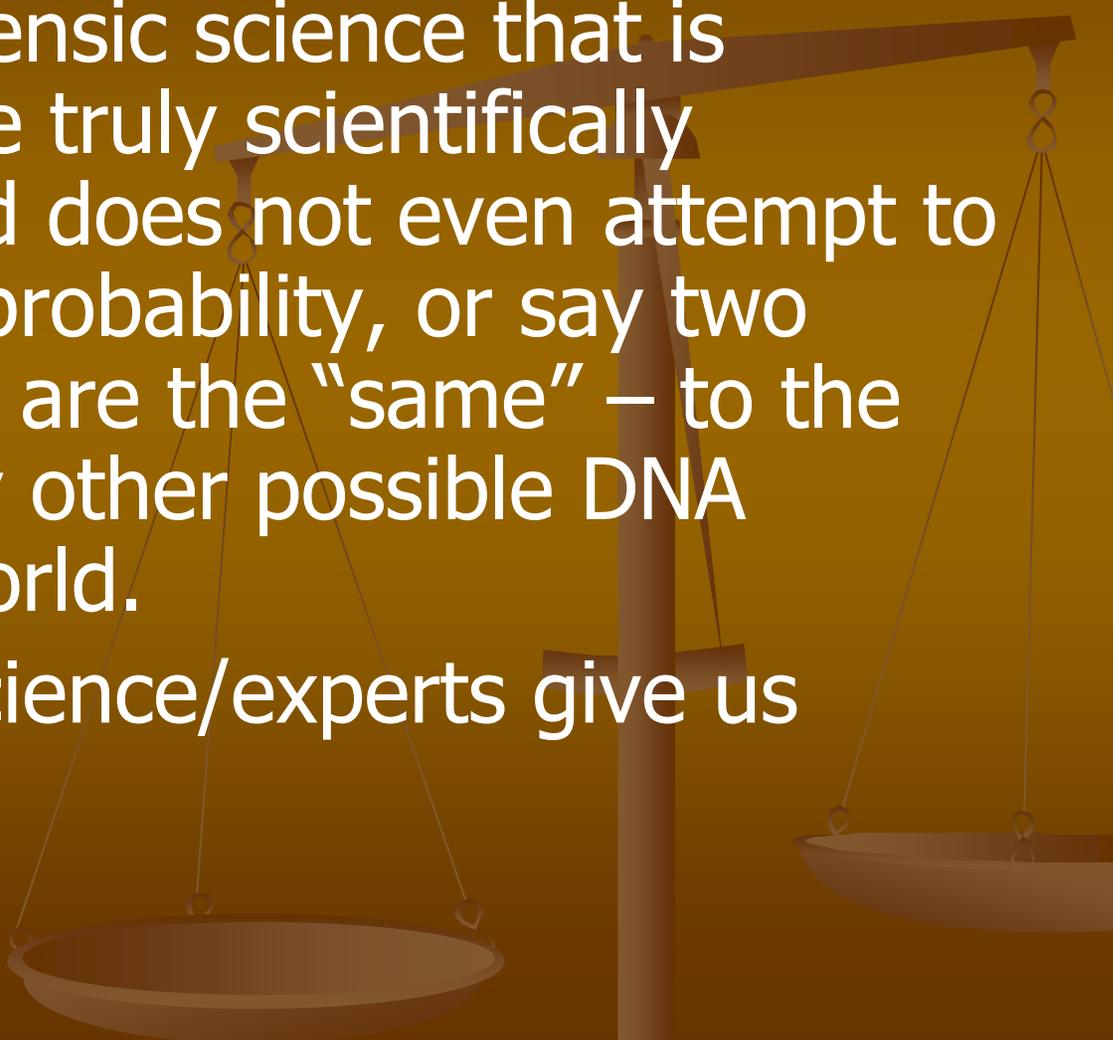
What is the significance of
a DNA match for example?

Data gives us the answer

The lesson from DNA

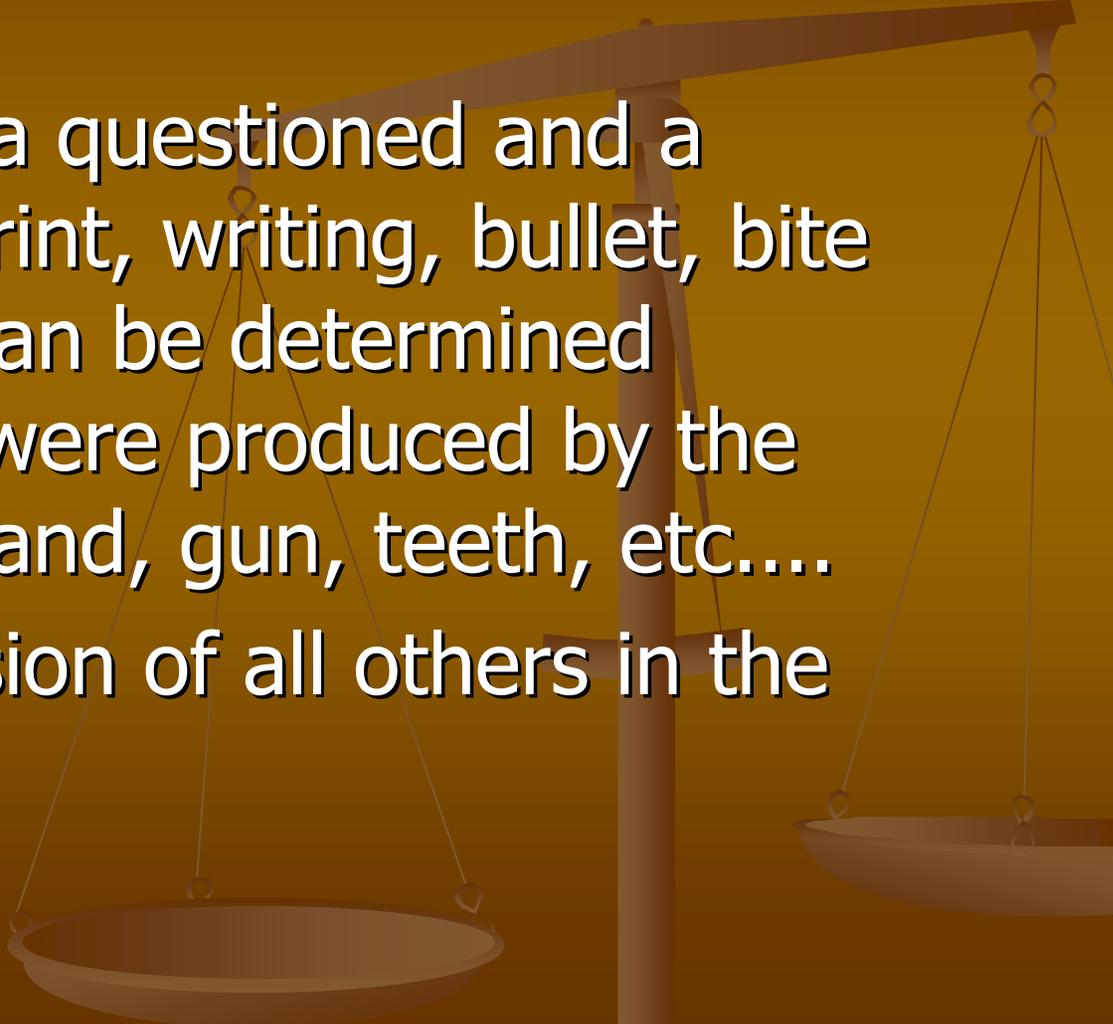
You cannot get to
unique individuality
using probability



- 
- So, the only forensic science that is recognized to be truly scientifically accurate or valid does not even attempt to give us unique probability, or say two samples of DNA are the “same” – to the exclusion of any other possible DNA source in the world.
 - Instead, DNA science/experts give us statistics.

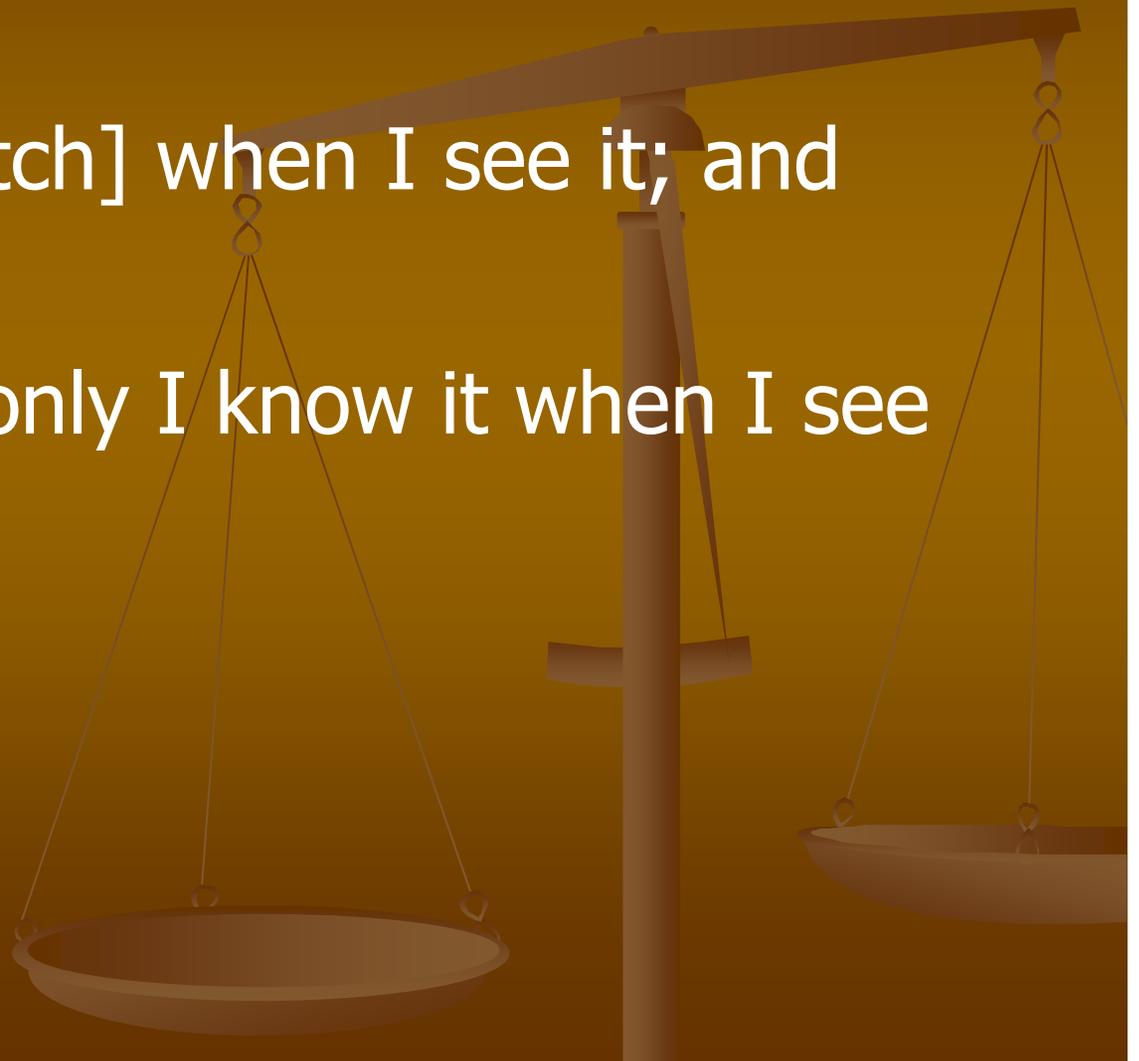
Yet Many Forensic Identification Sciences Claim that.....

By comparing a questioned and a known fingerprint, writing, bullet, bite mark, etc., it can be determined whether both were produced by the same finger, hand, gun, teeth, etc....
...to the exclusion of all others in the world.



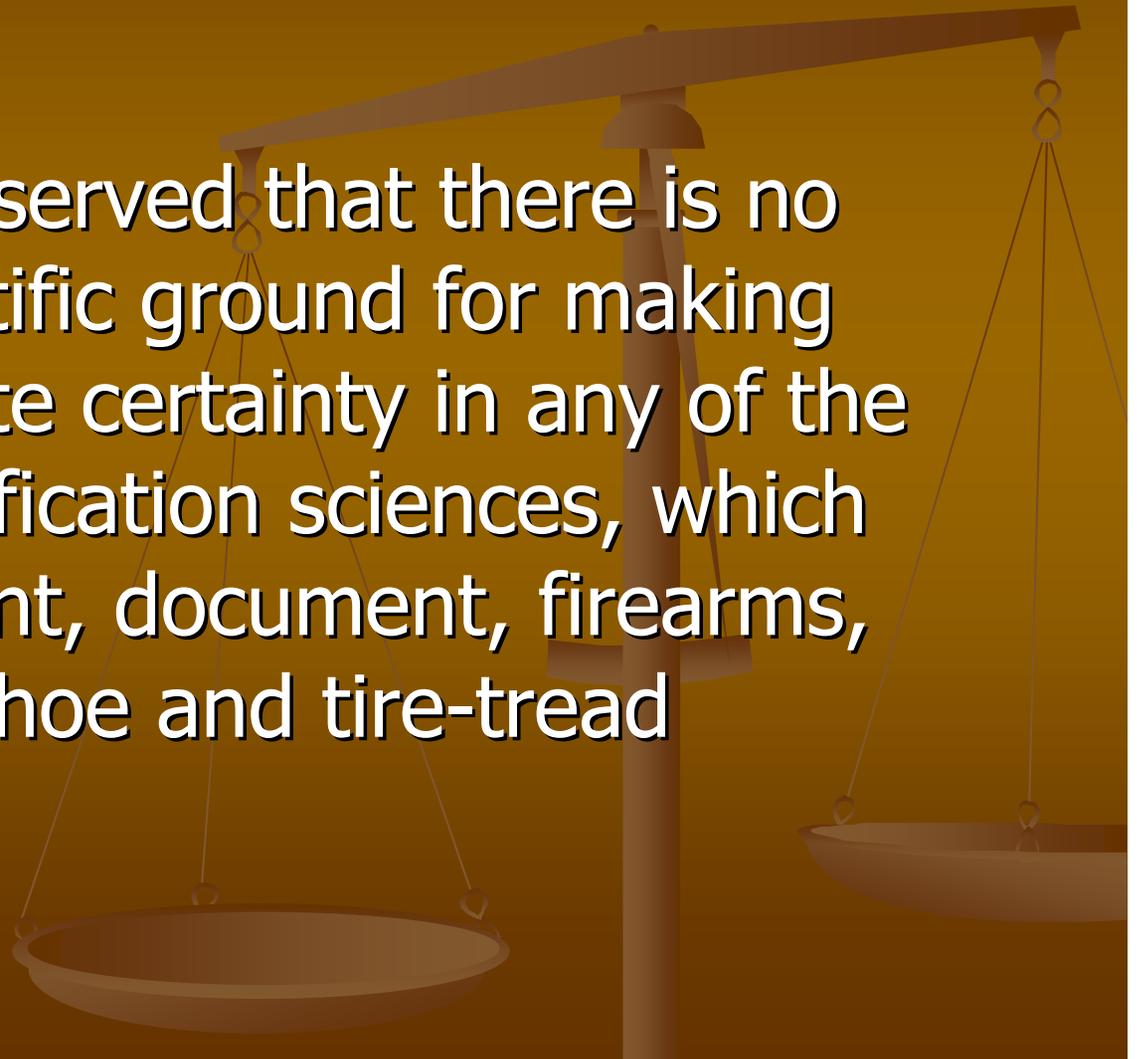
Common theme(s) of forensic scientists:

- I know it [a match] when I see it; and
- And of course, only I know it when I see it.

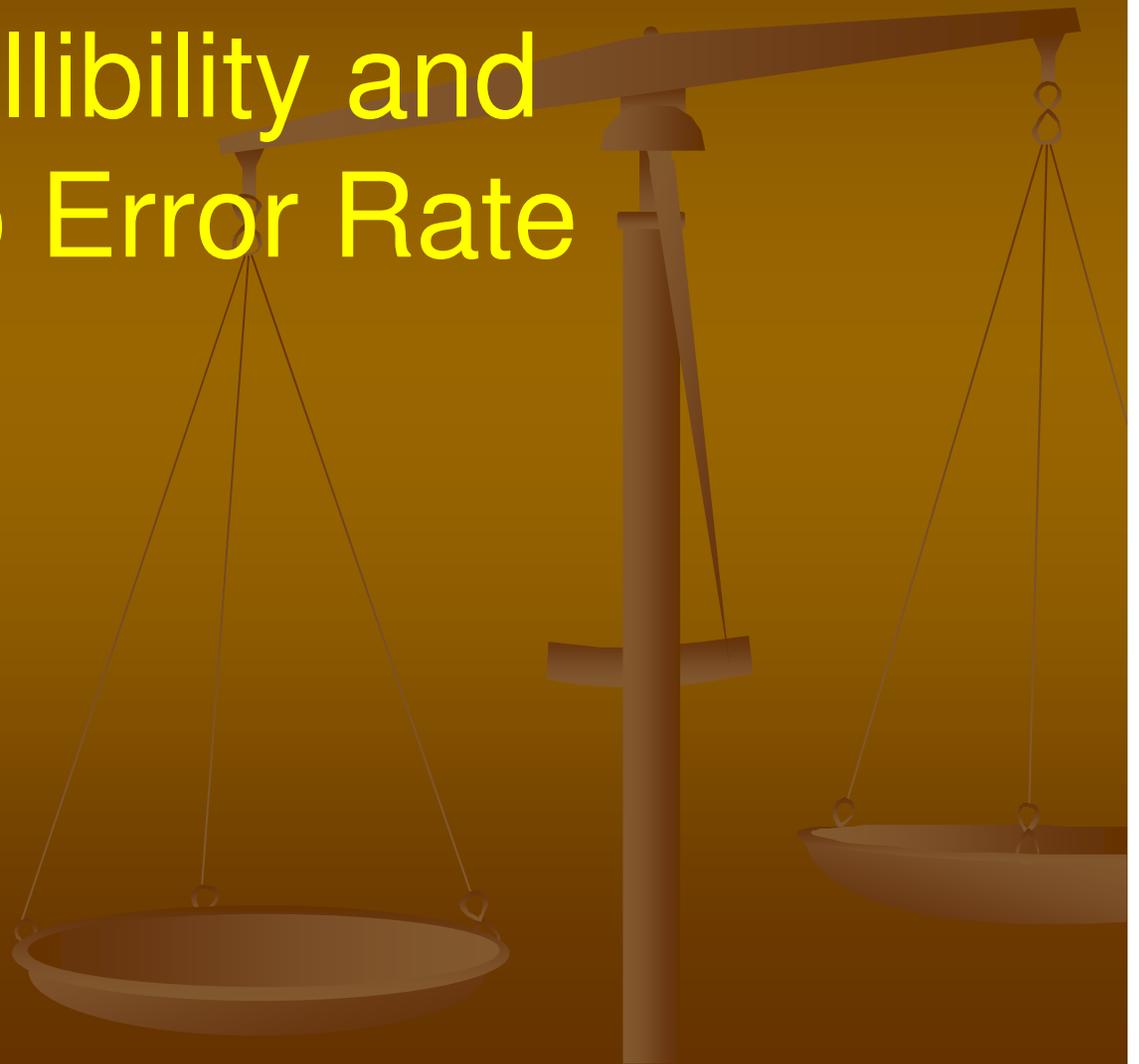


Bunch, JFS, 2000:

“[I]t must be observed that there is no rational or scientific ground for making claims of absolute certainty in any of the traditional identification sciences, which include fingerprint, document, firearms, tool mark, and shoe and tire-tread analysis.”



Infallibility and Zero Error Rate

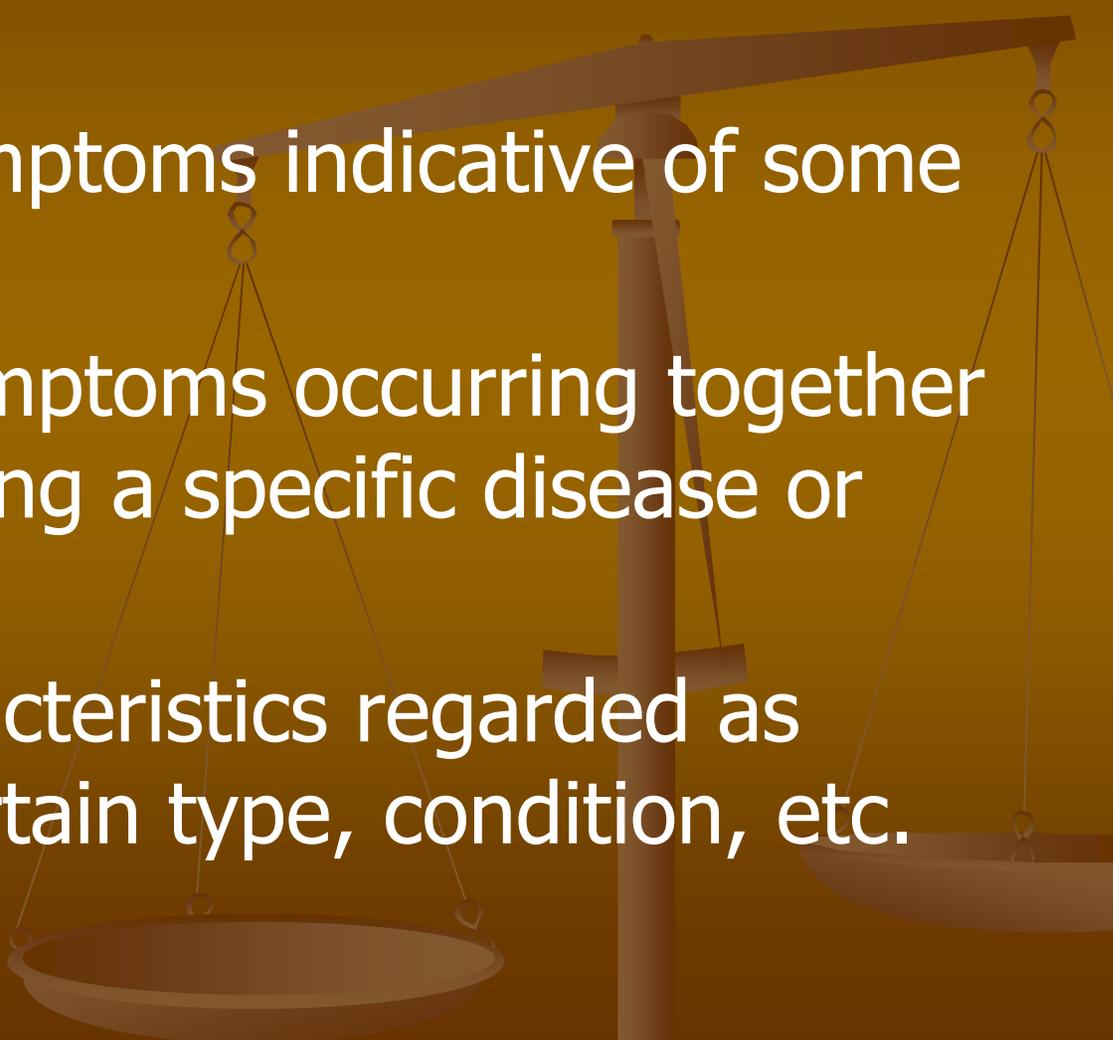


First, some definitions:

- **Syndrome**
- **Profile**
- **Indicator(s)**



Syndrome

- A pattern of symptoms indicative of some disease;
 - a number of symptoms occurring together and characterizing a specific disease or condition;
 - any set of characteristics regarded as identifying a certain type, condition, etc.
- 

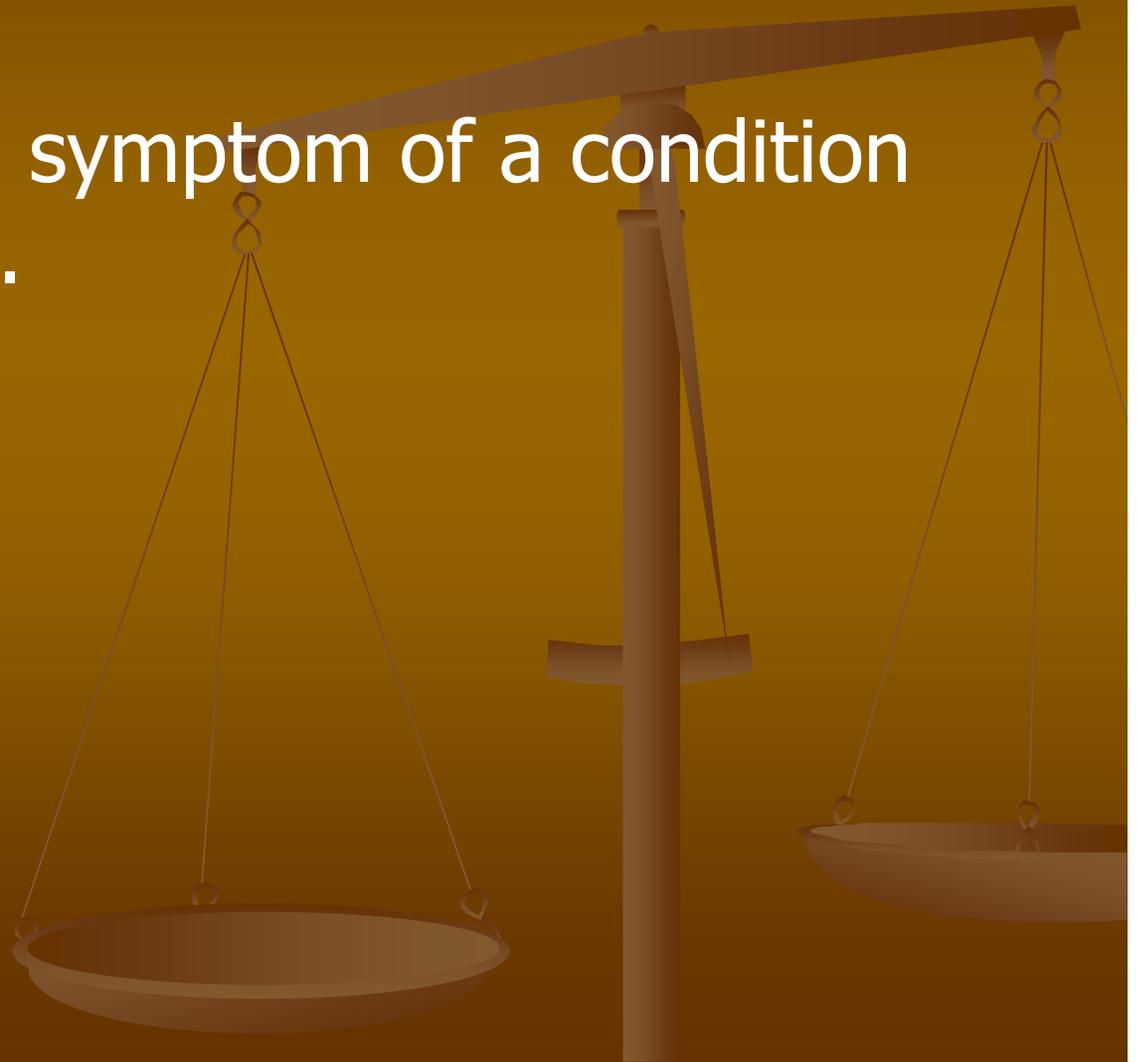
Profile

- A set of characteristics developed for use in identifying persons or things as being likely to belong to a certain group



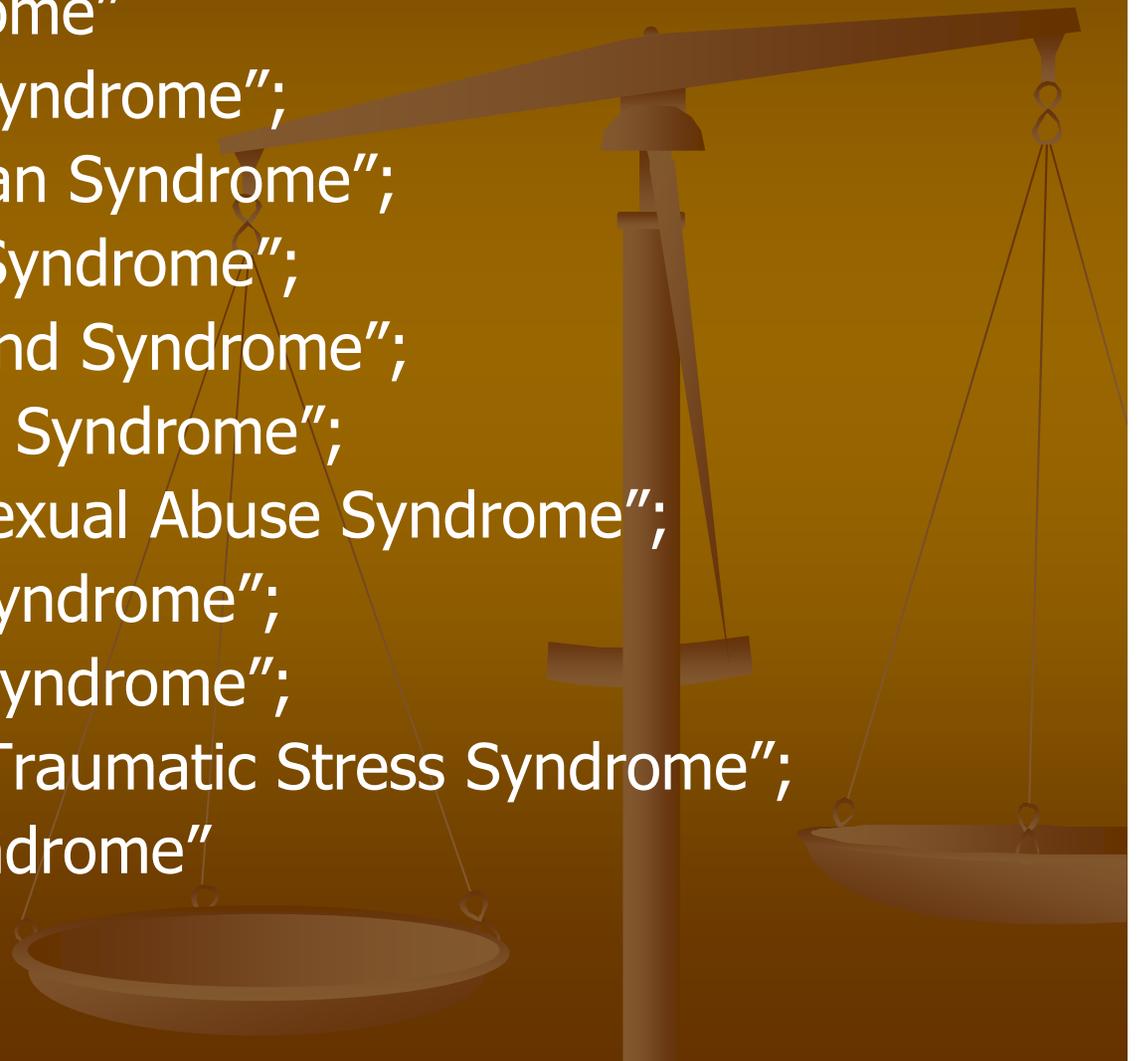
Indicators

- A signal for or a symptom of a condition or phenomenon.



Syndromes

- “Shaken Baby Syndrome”
- “The Battered Wife Syndrome”;
- “The Battered Woman Syndrome”;
- “The Battered Child Syndrome”;
- “The Battered Husband Syndrome”;
- “The Battered Parent Syndrome”;
- “The Familial Child Sexual Abuse Syndrome”;
- “The Rape Trauma Syndrome”;
- “The Battle Fatigue Syndrome”;
- “The Viet Nam Post-Traumatic Stress Syndrome”;
- “The Policeman’s Syndrome”



Profiles

- Drug-courier profile,
- Sex offender;
- smuggler's profile,
- battering parent profile,
- power rapist profile,



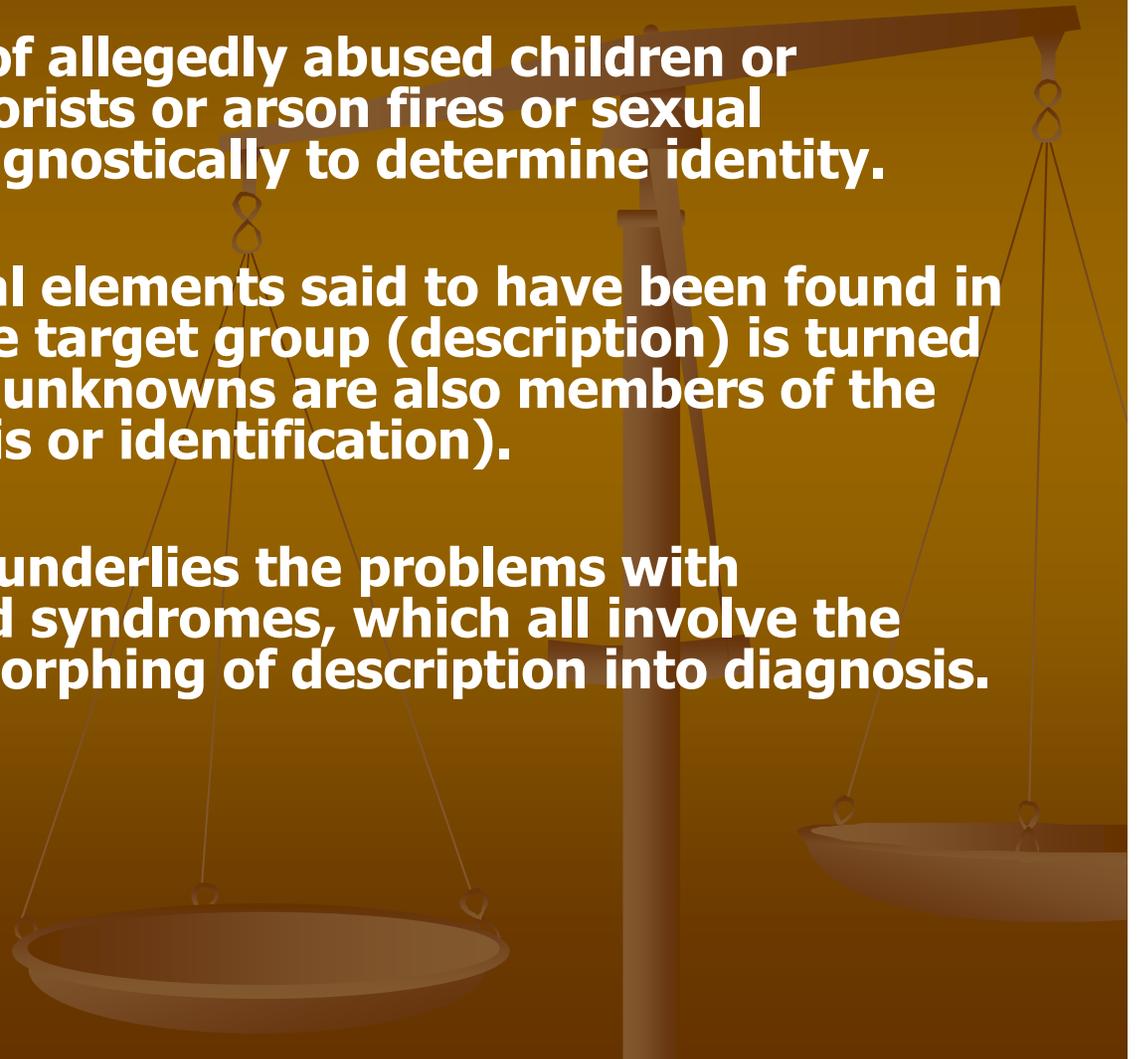
Indicators

- Sex abuse indicators;
- Arson indicators

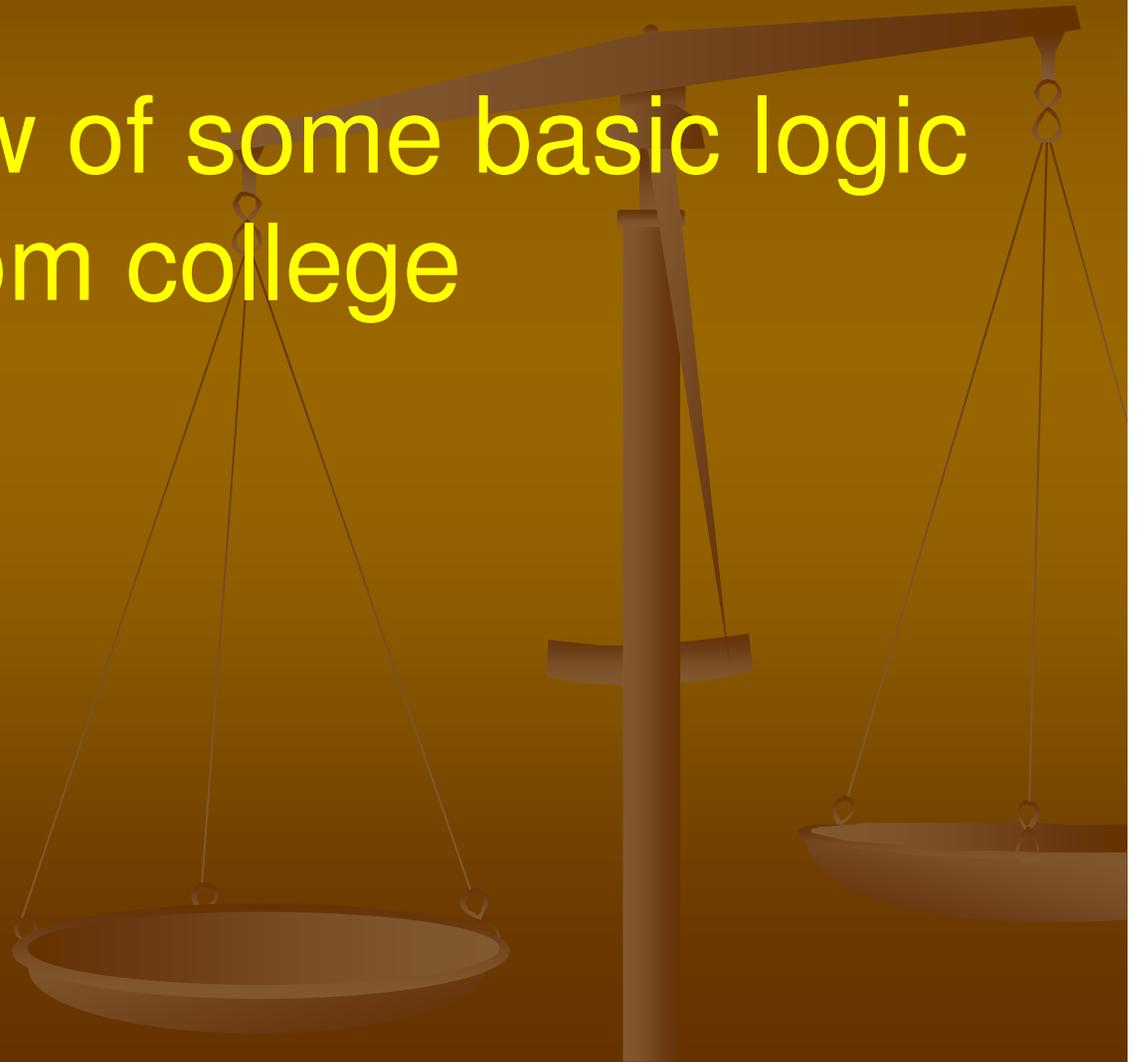


Problem – evolving from description to diagnosis

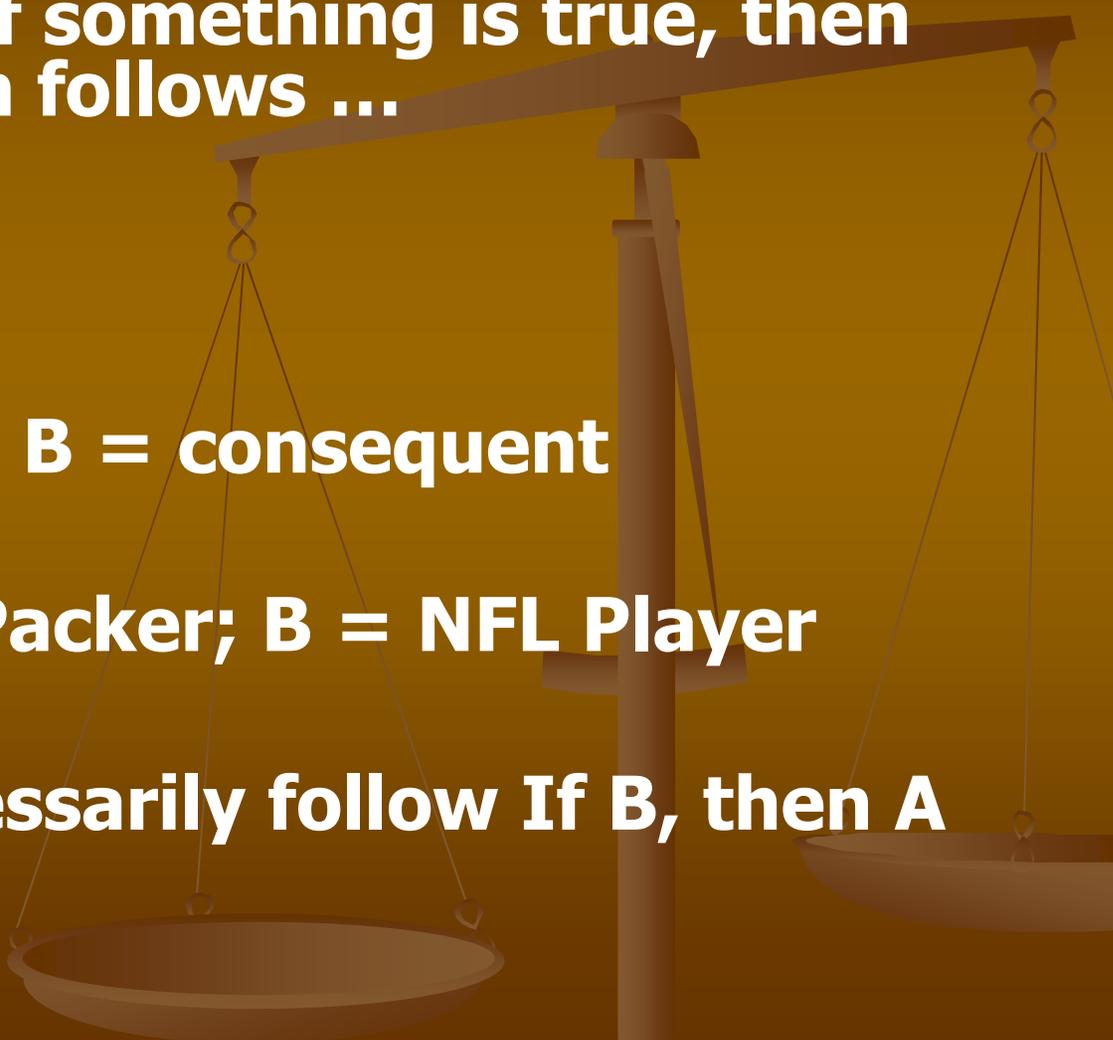
- **Descriptive elements of allegedly abused children or battered wives or terrorists or arson fires or sexual predators are used diagnostically to determine identity.**
- **The presence of factual elements said to have been found in known members of the target group (description) is turned into a test to decide if unknowns are also members of the target group (diagnosis or identification).**
- **There is a fallacy that underlies the problems with indicators, profiles and syndromes, which all involve the generally unreliable morphing of description into diagnosis.**
- **This is NOT SCIENCE!**



First, a review of some basic logic
from college



The fallacy of affirming the consequent

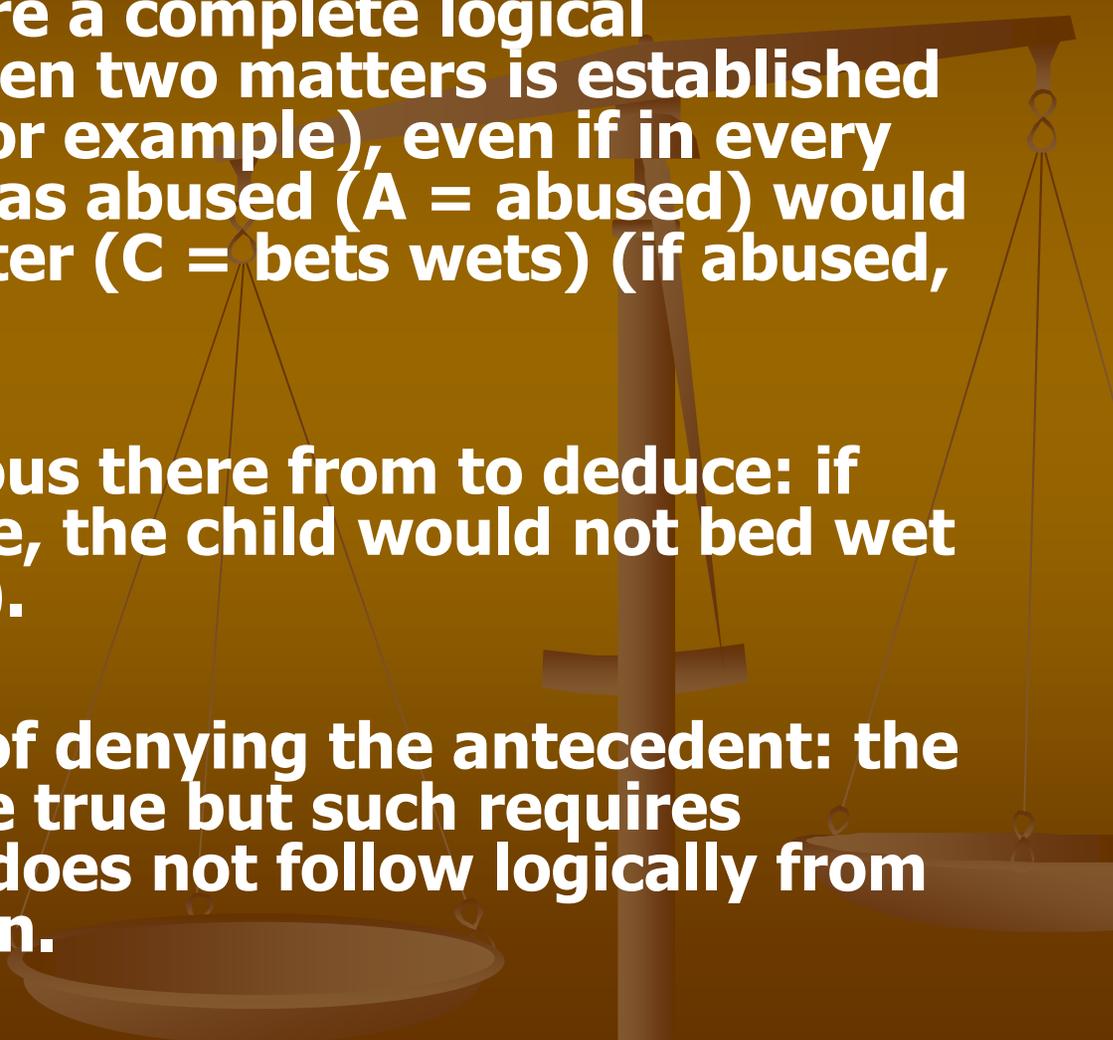
- The syllogism: If something is true, then some conclusion follows ...
 - If A, then B
 - A = antecedent; B = consequent
 - A = Green Bay Packer; B = NFL Player
 - It does not necessarily follow If B, then A
- 

Logical reasoning

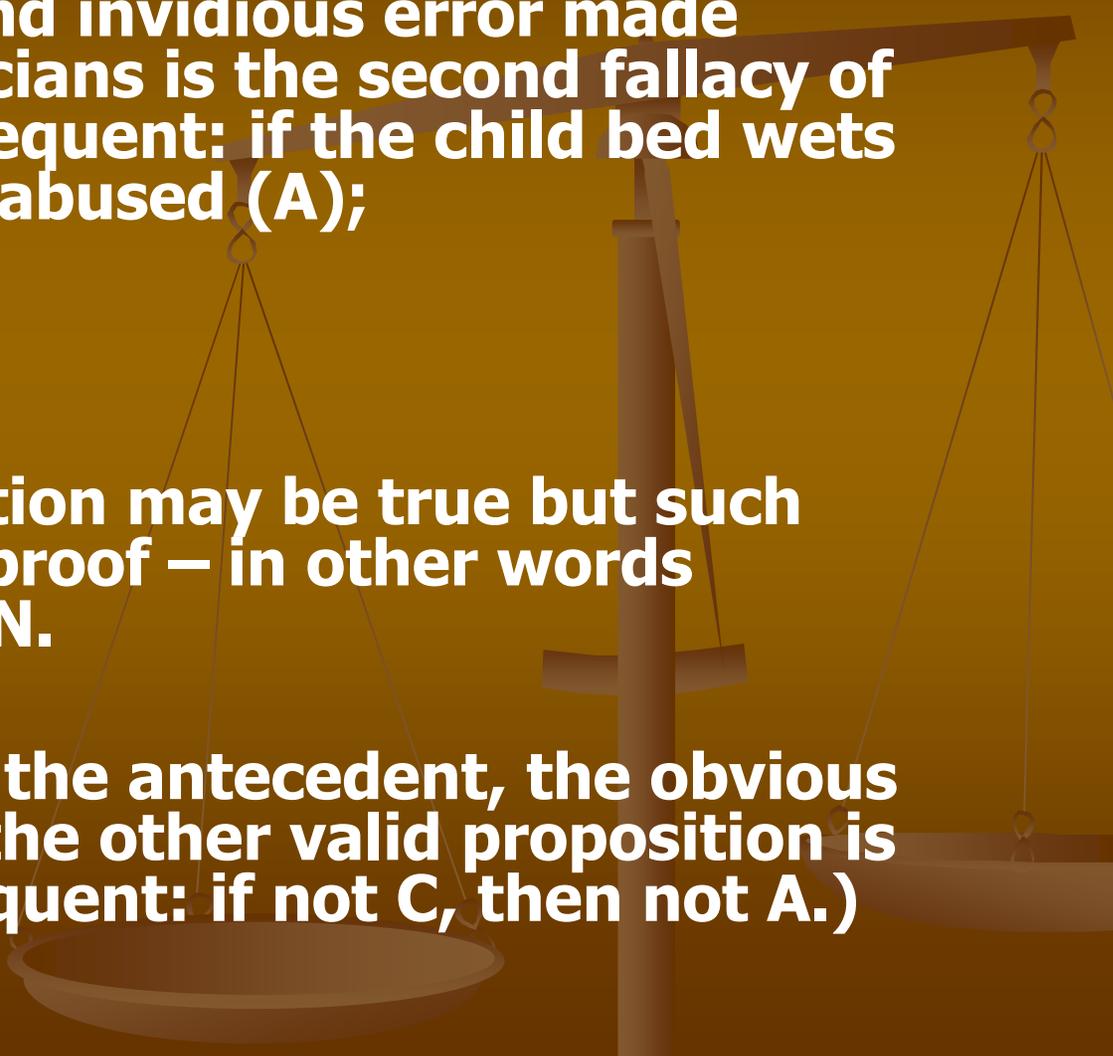


- **Two common logical fallacies have been known to the human race since the time of the ancient Greeks:**
 - * **denying the antecedent; and**
 - * **affirming the consequent.**

Denying the antecedent

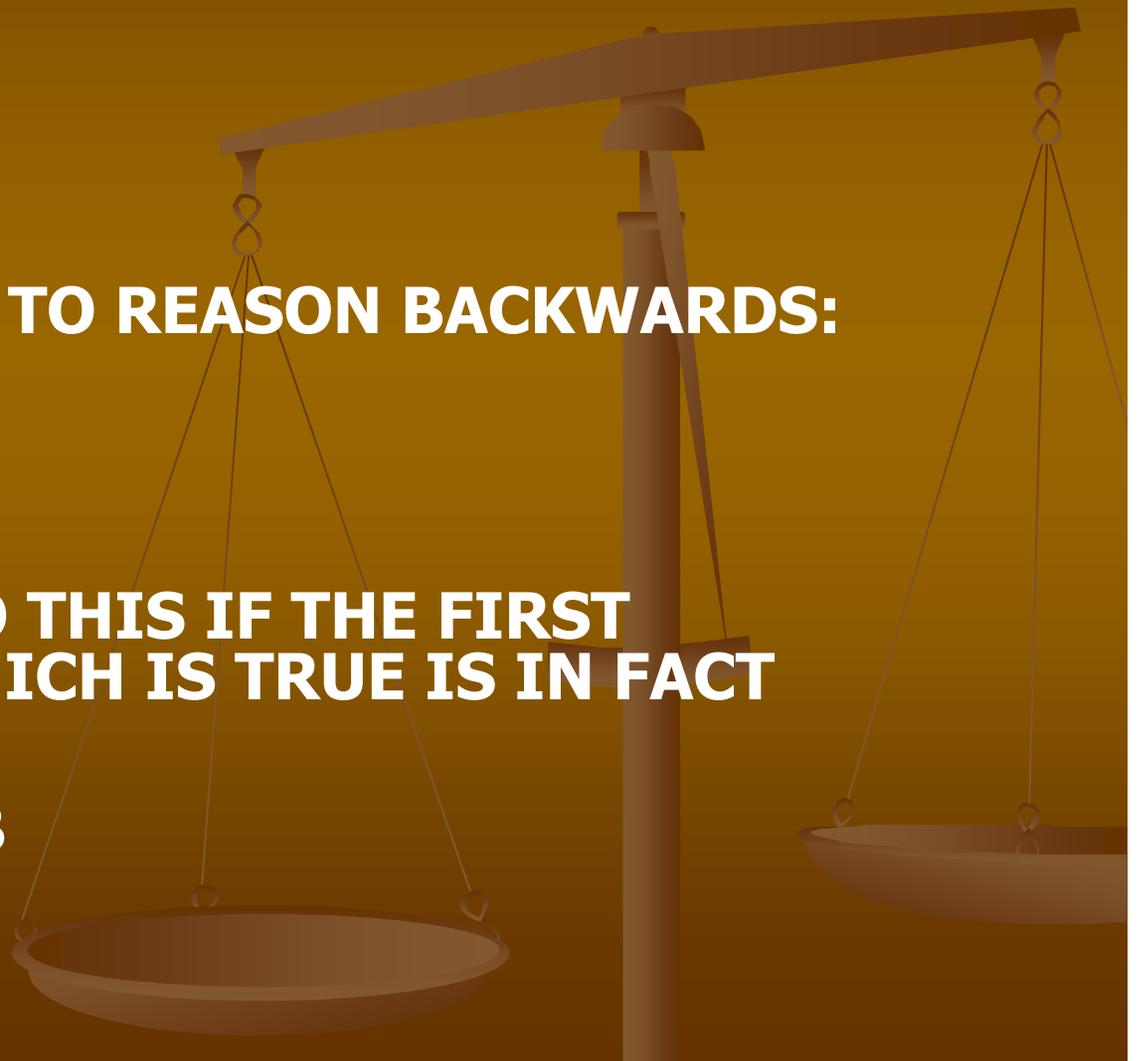
- In a situation where a complete logical relationship between two matters is established (i.e., if A, then C, for example), even if in every case a child that was abused (A = abused) would become a bed wetter (C = bed wets) (if abused, then bed wets),
 - it would be fallacious there from to deduce: if there was no abuse, the child would not bed wet (if no A, then no C).
 - This is the fallacy of denying the antecedent: the proposition may be true but such requires separate proof. It does not follow logically from the first proposition.
- 

Affirming the consequent

- A more common and invidious error made constantly by clinicians is the second fallacy of affirming the consequent: if the child bed wets (C), he or she was abused (A);
 - Or, if C then A.
 - Again, the proposition may be true but such requires separate proof – in other words **EXPERIMENTATION**.
 - (Besides affirming the antecedent, the obvious valid proposition, the other valid proposition is denying the consequent: if not C, then not A.)
- 

THE FALLACY OF AFFIRMING THE CONSEQUENT

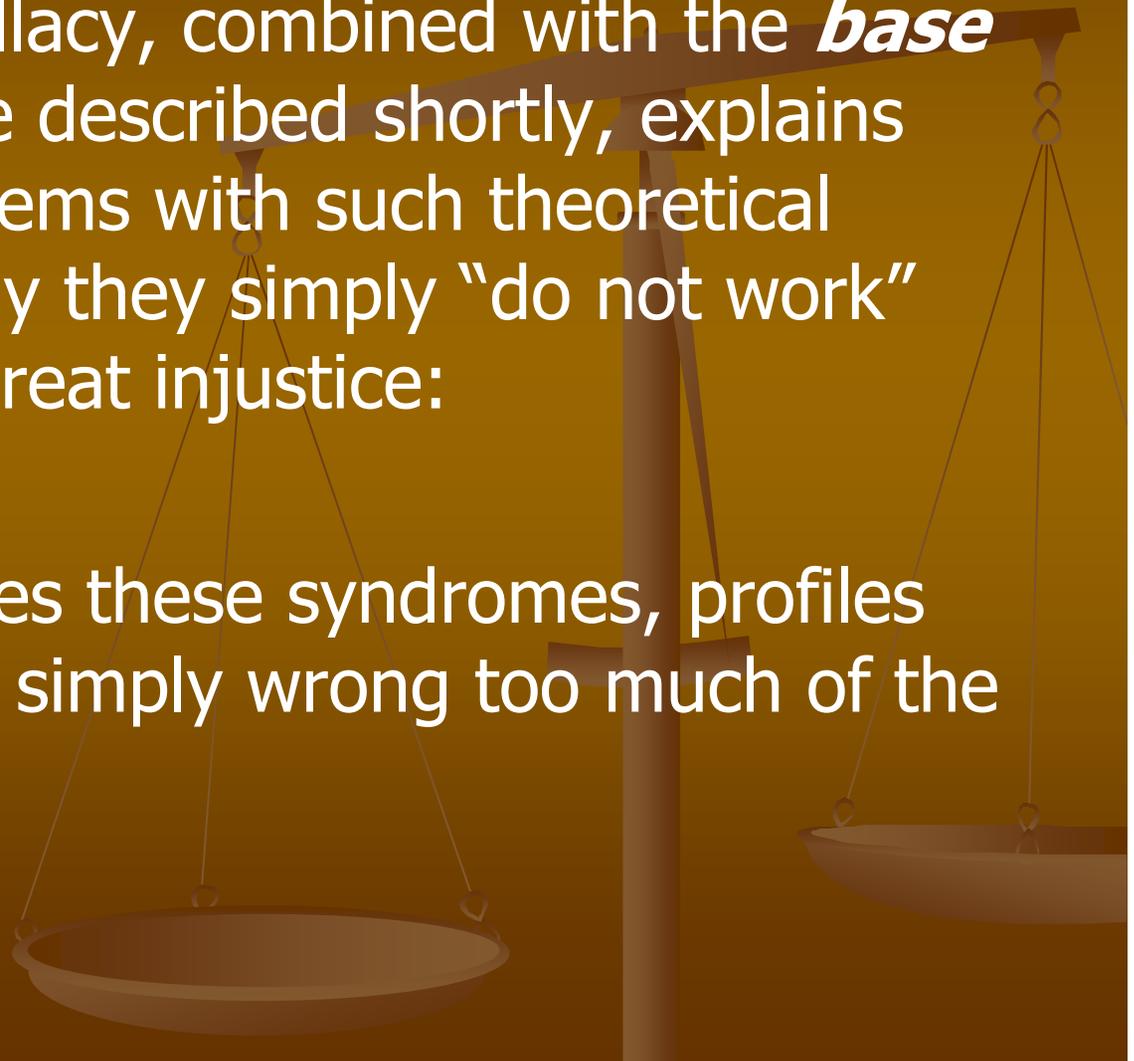
- IF A THEN B
- IT IS FALLACIOUS TO REASON BACKWARDS:
IF B THEN A
- YOU CAN ONLY DO THIS IF THE FIRST PROPOSITION WHICH IS TRUE IS IN FACT
- *ONLY* IF A THEN B



Houston, we have a problem!

This underlying fallacy, combined with the *base rate fallacy* to be described shortly, explains the practical problems with such theoretical constructs and why they simply “do not work” without creating great injustice:

fathered by fallacies these syndromes, profiles and indicators are simply wrong too much of the time.



Logically it is the difference between:

Every child who is abused bed wets; and
only a child who is abused bed wets.

- A syndrome, profile or group of indicators can only be used diagnostically where the factual data apply only to the target group and never to the non-target group.
- Such rarely if ever obtains.

Base Rate Fallacy

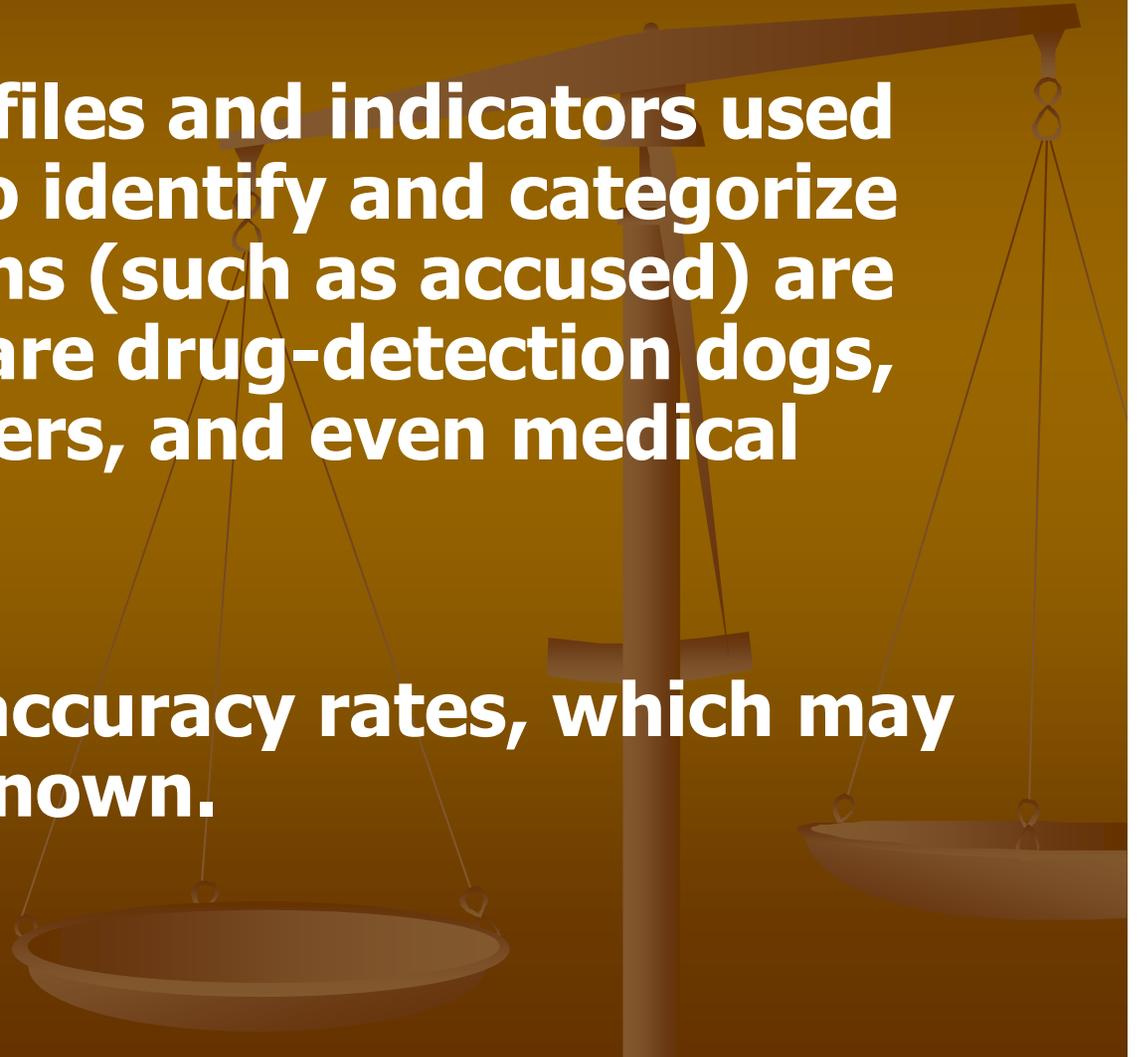


False Positives

- In any other case, *even if* every member of the target group demonstrated the syndrome, profile or group of indicators (i.e., every abused child bed wetted), there will be members of the non-group (the “innocents”) who will also show the same factual features (non-abused children that bed wet).
- This means the problem of false positives must be considered.

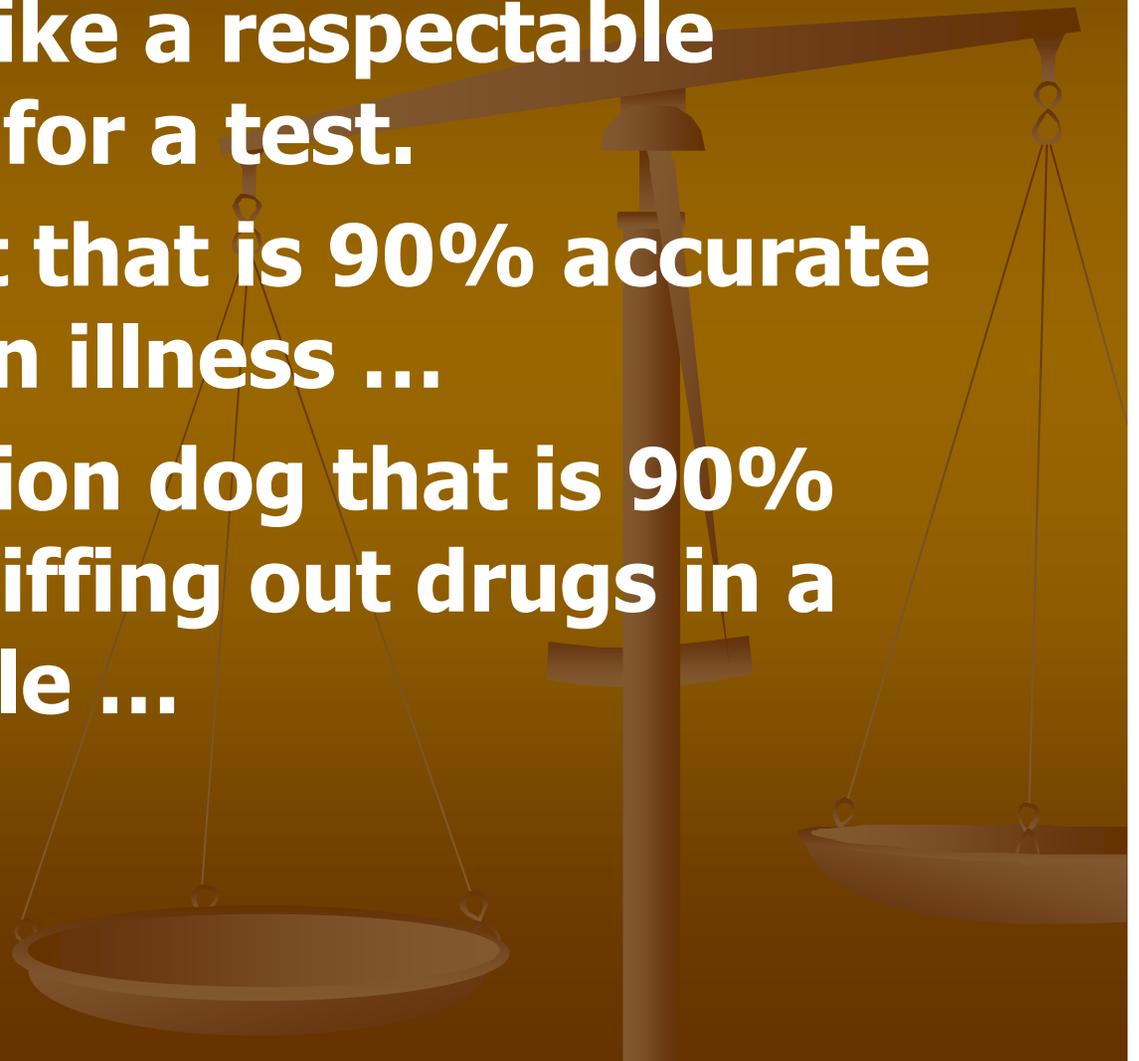
THE BASE RATE FALLACY

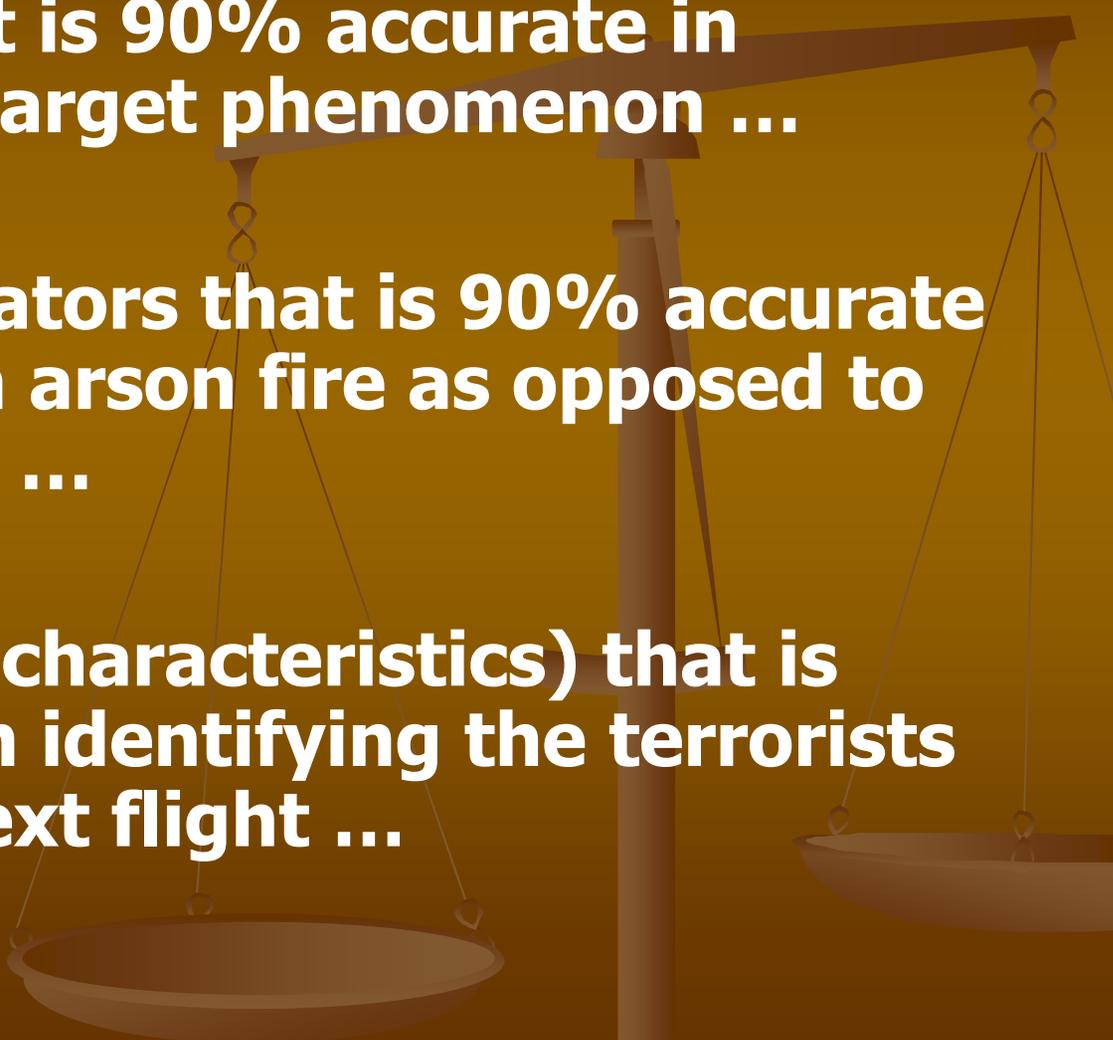
- Syndromes, profiles and indicators used diagnostically to identify and categorize unknown persons (such as accused) are “tests”, just as are drug-detection dogs, DRE police officers, and even medical tests.
- *ALL* tests have accuracy rates, which may or may not be known.



90% sounds like a respectable accuracy rate for a test.

- **A medical test that is 90% accurate in detecting an illness ...**
- **A drug-detection dog that is 90% accurate in sniffing out drugs in a stopped vehicle ...**



- 
- **A syndrome that is 90% accurate in identifying the target phenomenon ...**
 - **A group of indicators that is 90% accurate in identifying an arson fire as opposed to an innocent one ...**
 - **A profile (set of characteristics) that is 90% accurate in identifying the terrorists in line for the next flight ...**

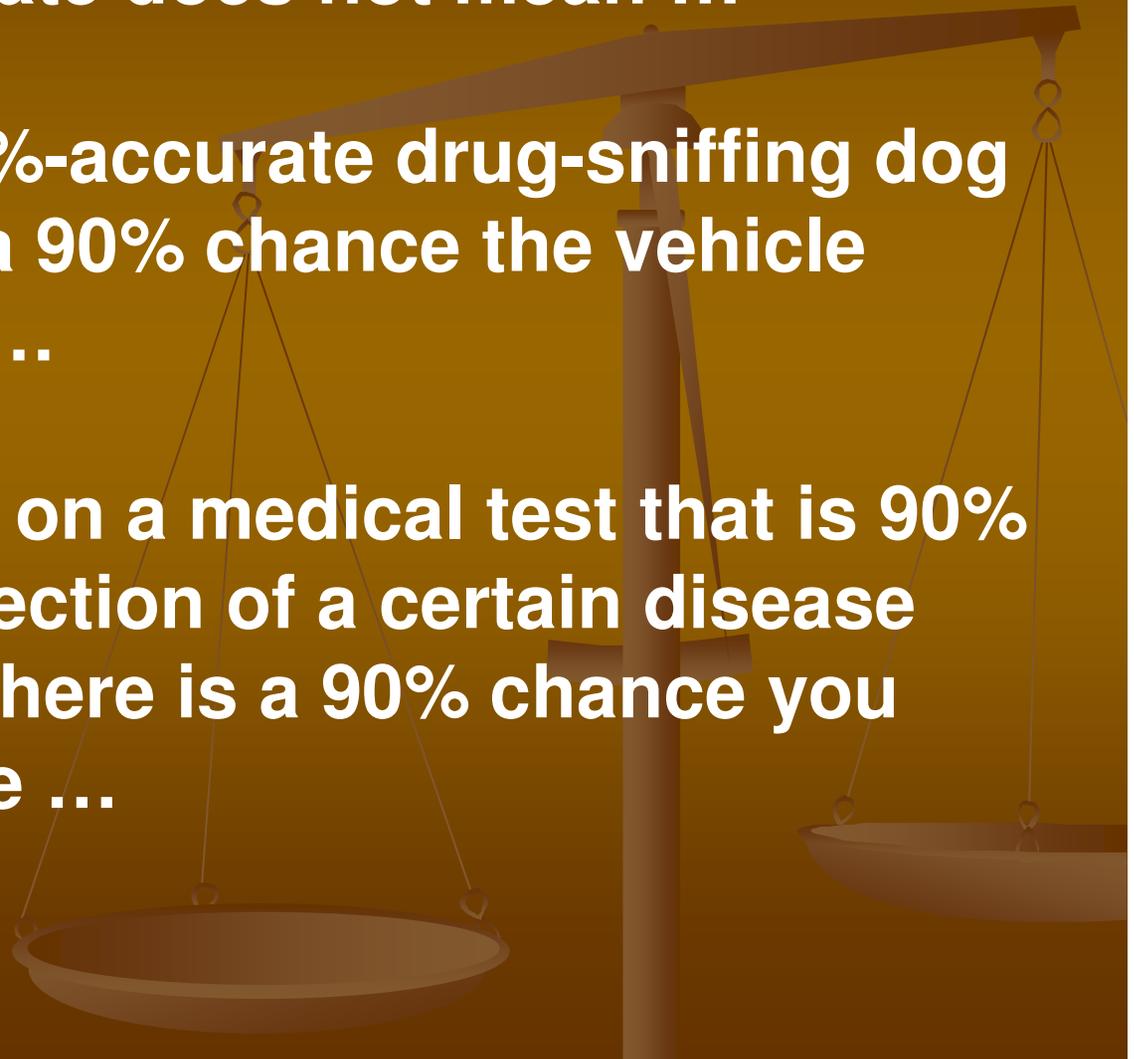
However, the significance of a positive test result cannot be reliably evaluated by consideration only of the test's accuracy rate.

Having the characteristics for a battered wife where that syndrome of characteristics has been shown to be 90% accurate in identifying battered wives does not mean there is a 90% chance the identified individual is in fact a BW.

Having the characteristics to fit the profile of a terrorist where the profile has been proved to be 90% accurate does not mean ...

An alert by a 90%-accurate drug-sniffing dog does not mean a 90% chance the vehicle contains drugs ...

Testing positive on a medical test that is 90% accurate for detection of a certain disease does not mean there is a 90% chance you have the disease ...

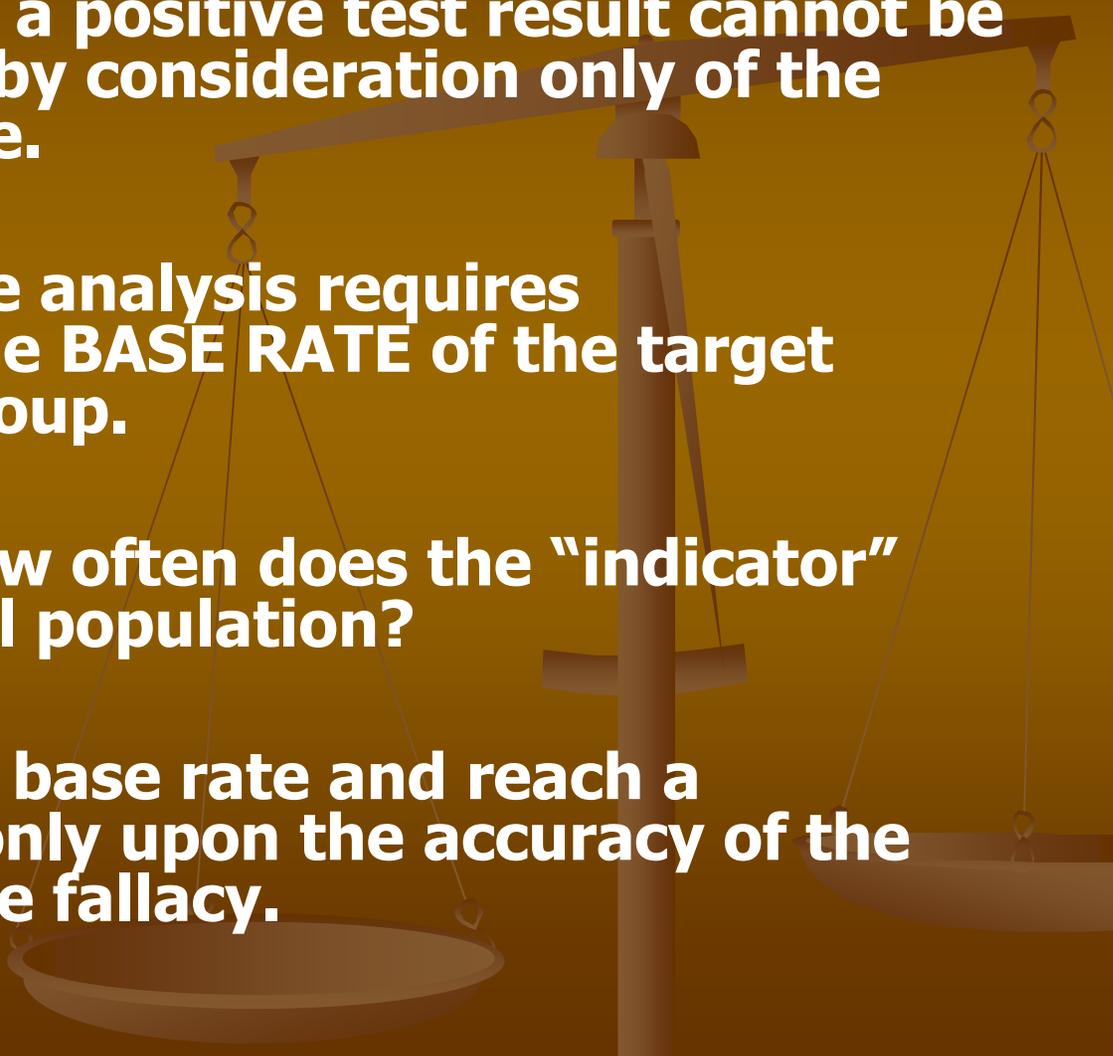


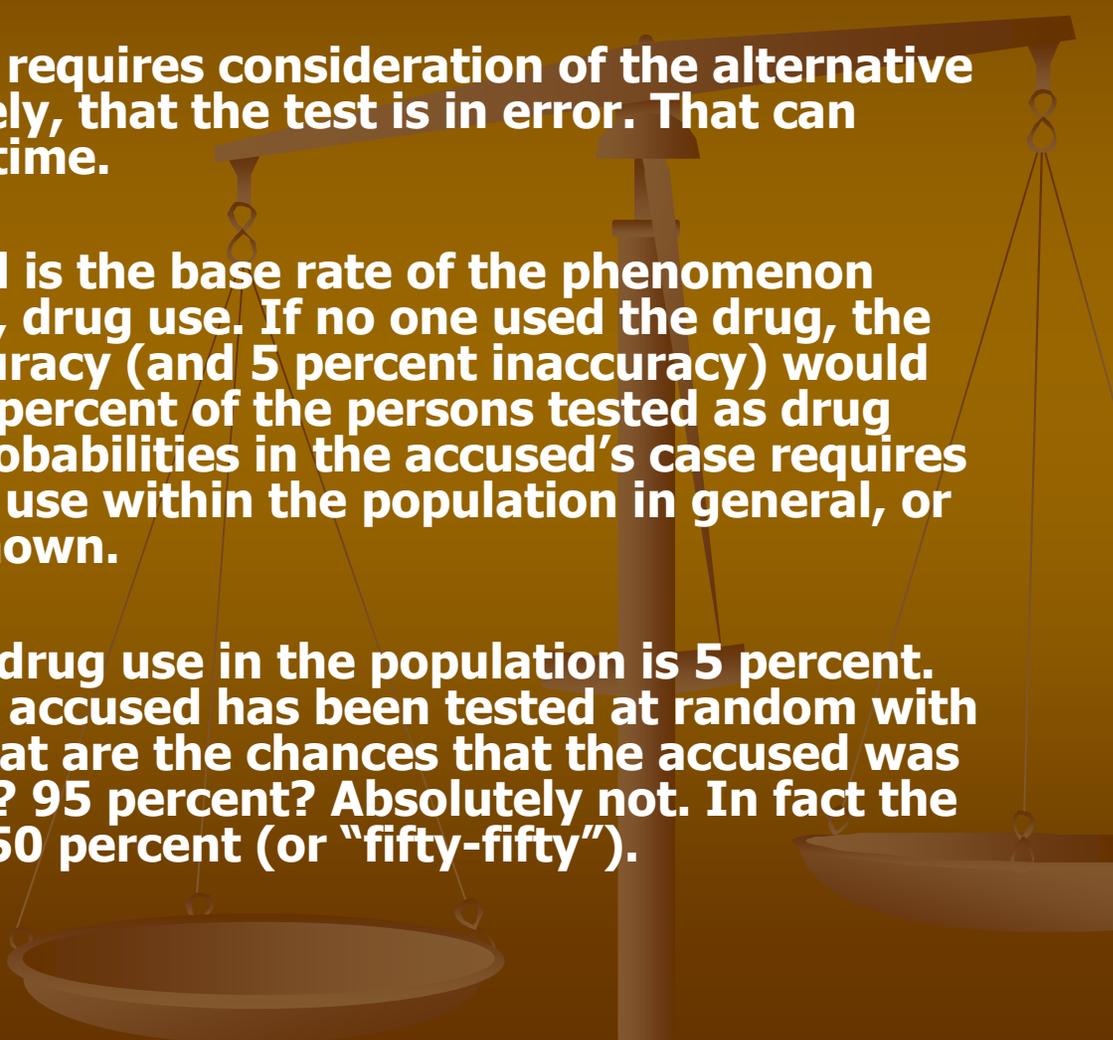
A balance scale is shown against a dark brown background. The scale's beam is tilted upwards on the right side, indicating that the left pan is heavier. The scale is rendered in a dark brown color, matching the background. The text 'Why?' is written in yellow, and 'The phenomenon of the base rate fallacy.' is written in white.

Why?

The phenomenon of the base rate fallacy.

Base Rate Fallacy

- **The significance of a positive test result cannot be reliably evaluated by consideration only of the test's accuracy rate.**
 - **Logical and reliable analysis requires consideration of the BASE RATE of the target phenomenon or group.**
 - **In other words, how often does the "indicator" exist in the general population?**
 - **Failure to consider base rate and reach a conclusion based only upon the accuracy of the test is the base rate fallacy.**
- 

- 
- **If a drug test is 95 percent accurate, what is the appropriate evidentiary value of a positive result? For example, what does it mean for an accused who denies taking any drug in the face of a positive test result? Does the test mean it is 95 percent certain the accused in fact took the drug, contrary to his protestations?**
 - **Answering the questions requires consideration of the alternative hypothesis to guilt, namely, that the test is in error. That can happen 5 percent of the time.**
 - **What must be considered is the base rate of the phenomenon being looked for, namely, drug use. If no one used the drug, the test with 95 percent accuracy (and 5 percent inaccuracy) would still (wrongly) identify 5 percent of the persons tested as drug users. So deciding the probabilities in the accused's case requires some knowledge of drug use within the population in general, or the "base rate" as it is known.**
 - **Assume the incidence of drug use in the population is 5 percent. Given that base rate: the accused has been tested at random with positive results. Then what are the chances that the accused was in fact a user of the drug? 95 percent? Absolutely not. In fact the probabilities are merely 50 percent (or "fifty-fifty").**

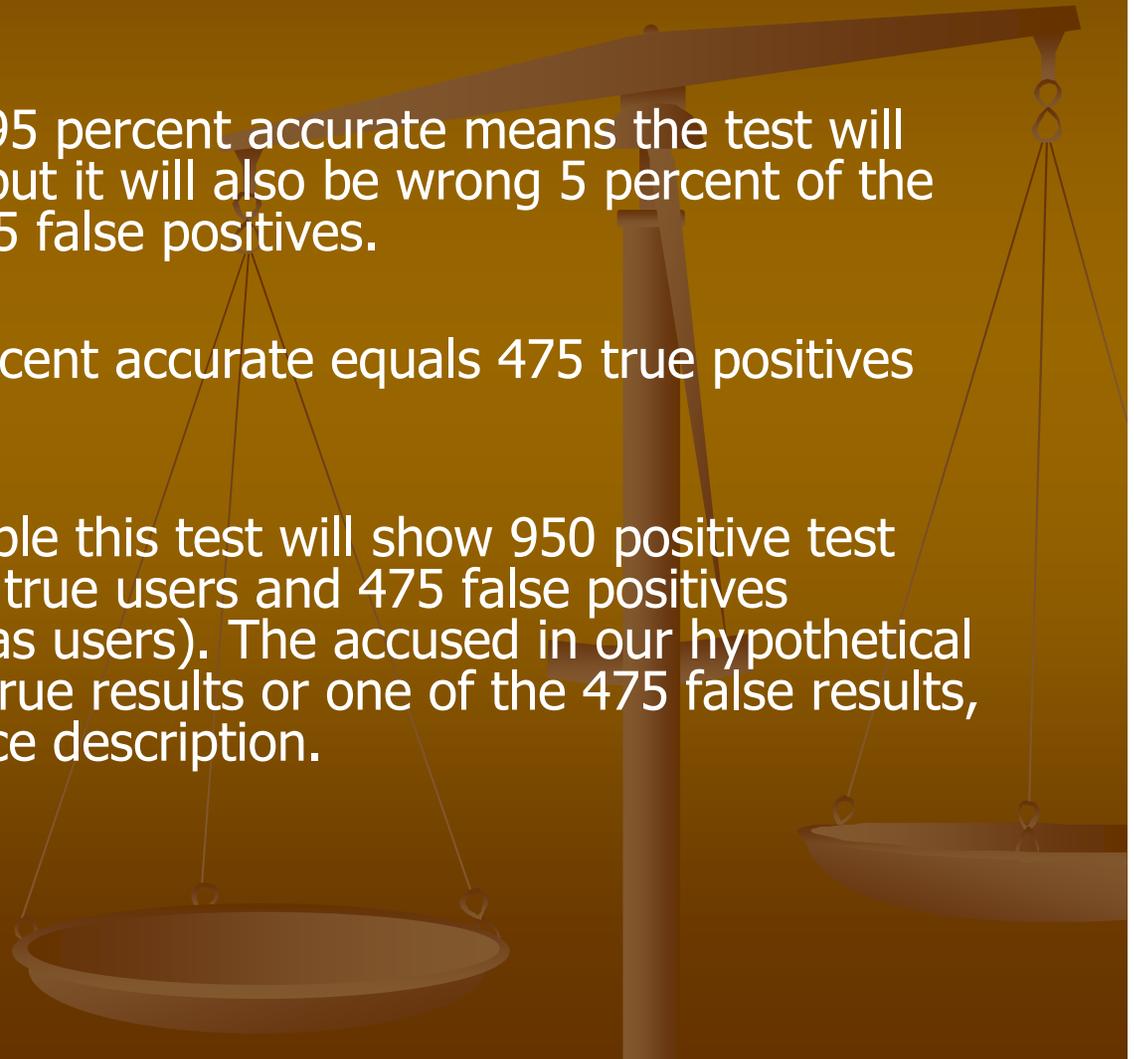
Consider a population of 10,000 people.

With a 5 percent rate of incidence, 9,500 are nonusers and 500 are users.

For the 9,500 nonusers, 95 percent accurate means the test will identify 9,025 negatives but it will also be wrong 5 percent of the time and thus identify 475 false positives.

For the 500 users, 95 percent accurate equals 475 true positives and 25 false negatives.

Thus, among 10,000 people this test will show 950 positive test results, consisting of 475 true users and 475 false positives (nonusers falsely shown as users). The accused in our hypothetical could be one of the 475 true results or one of the 475 false results, thus the "fifty-fifty" chance description.

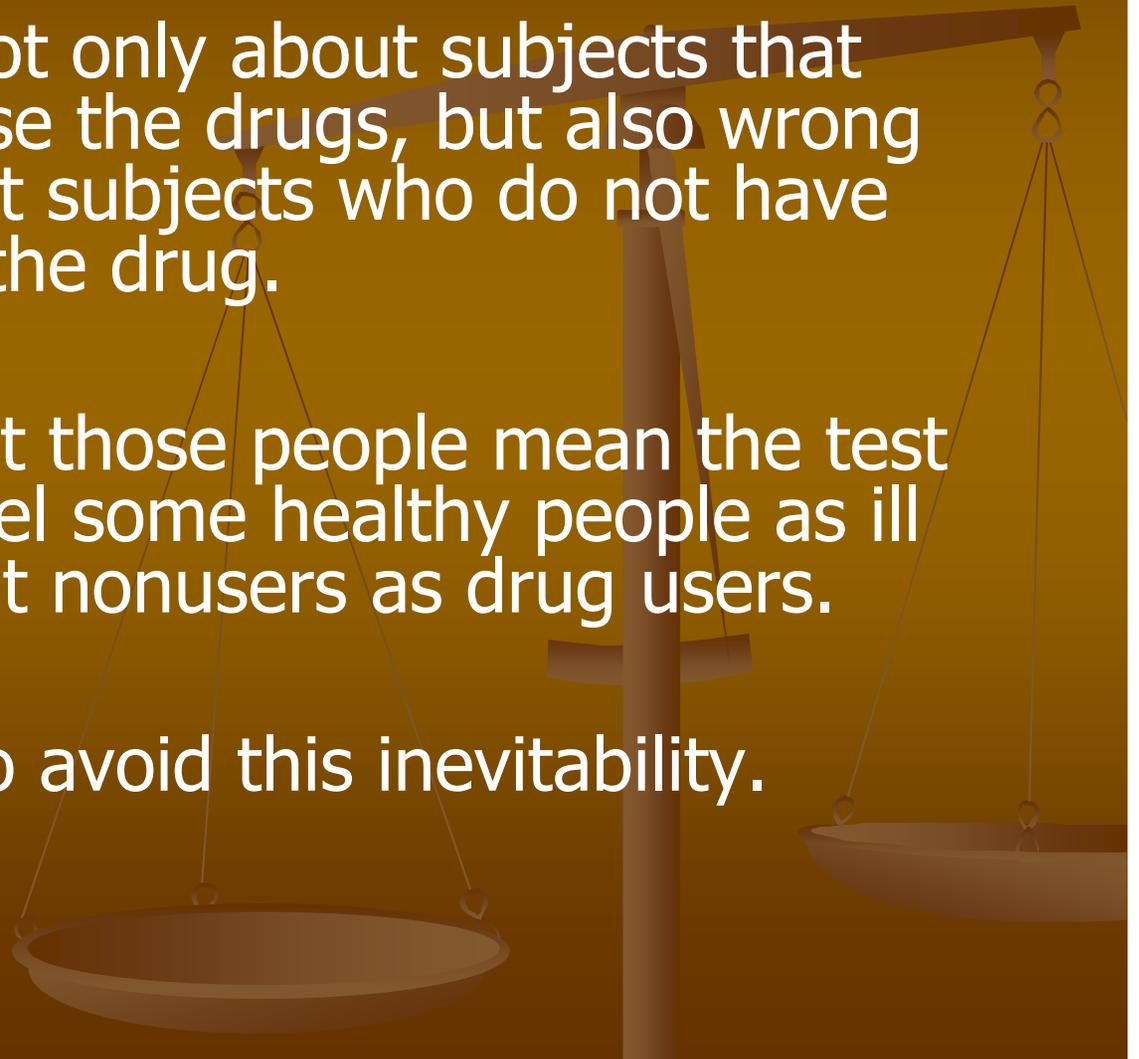


Any test that is less than 100% accurate will be wrong some percentage of the time.

It will be wrong not only about subjects that have the illness/use the drugs, but also wrong about the innocent subjects who do not have the illness or use the drug.

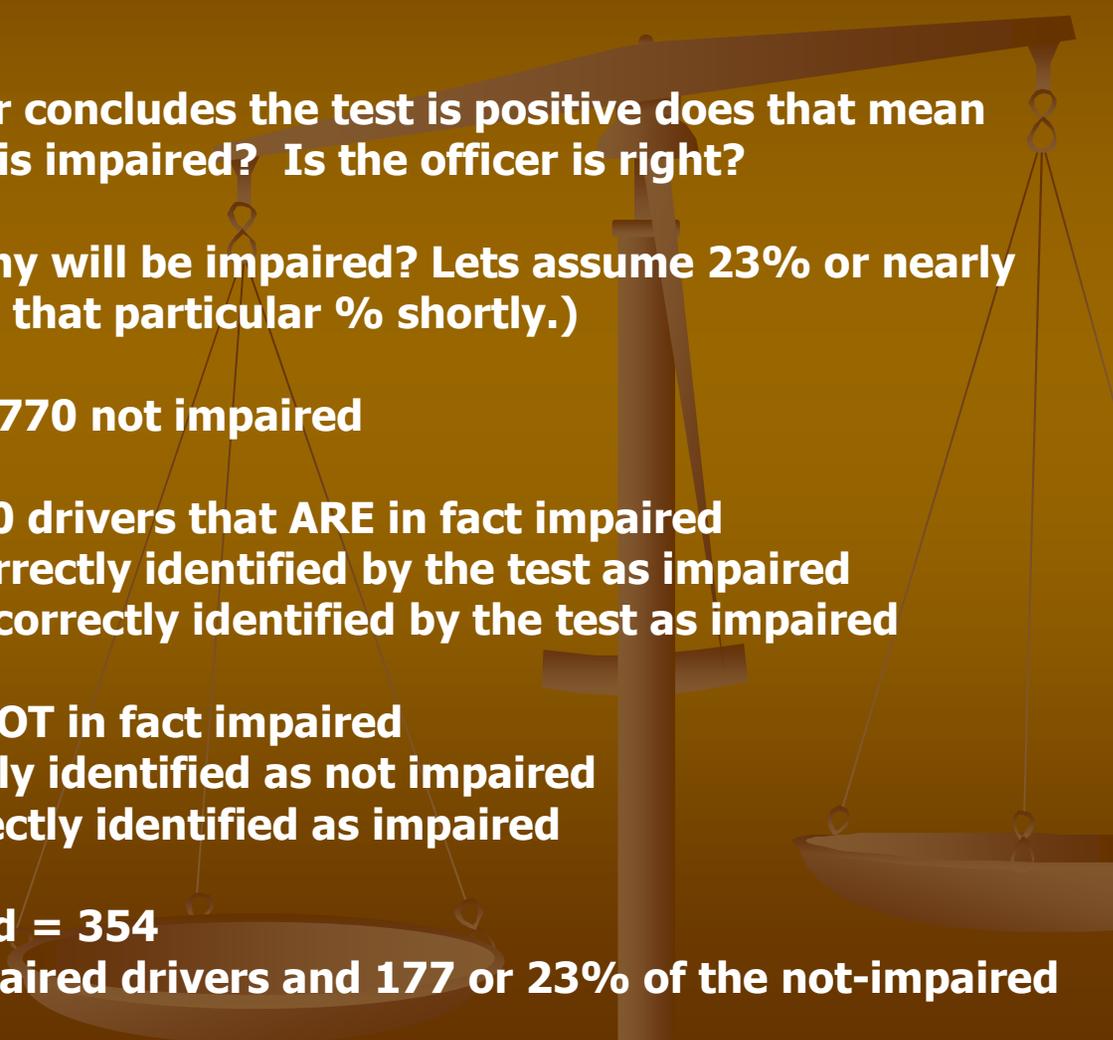
Being wrong about those people mean the test will incorrectly label some healthy people as ill and some innocent nonusers as drug users.

There is no way to avoid this inevitability.



Target phenomenon Impaired drivers

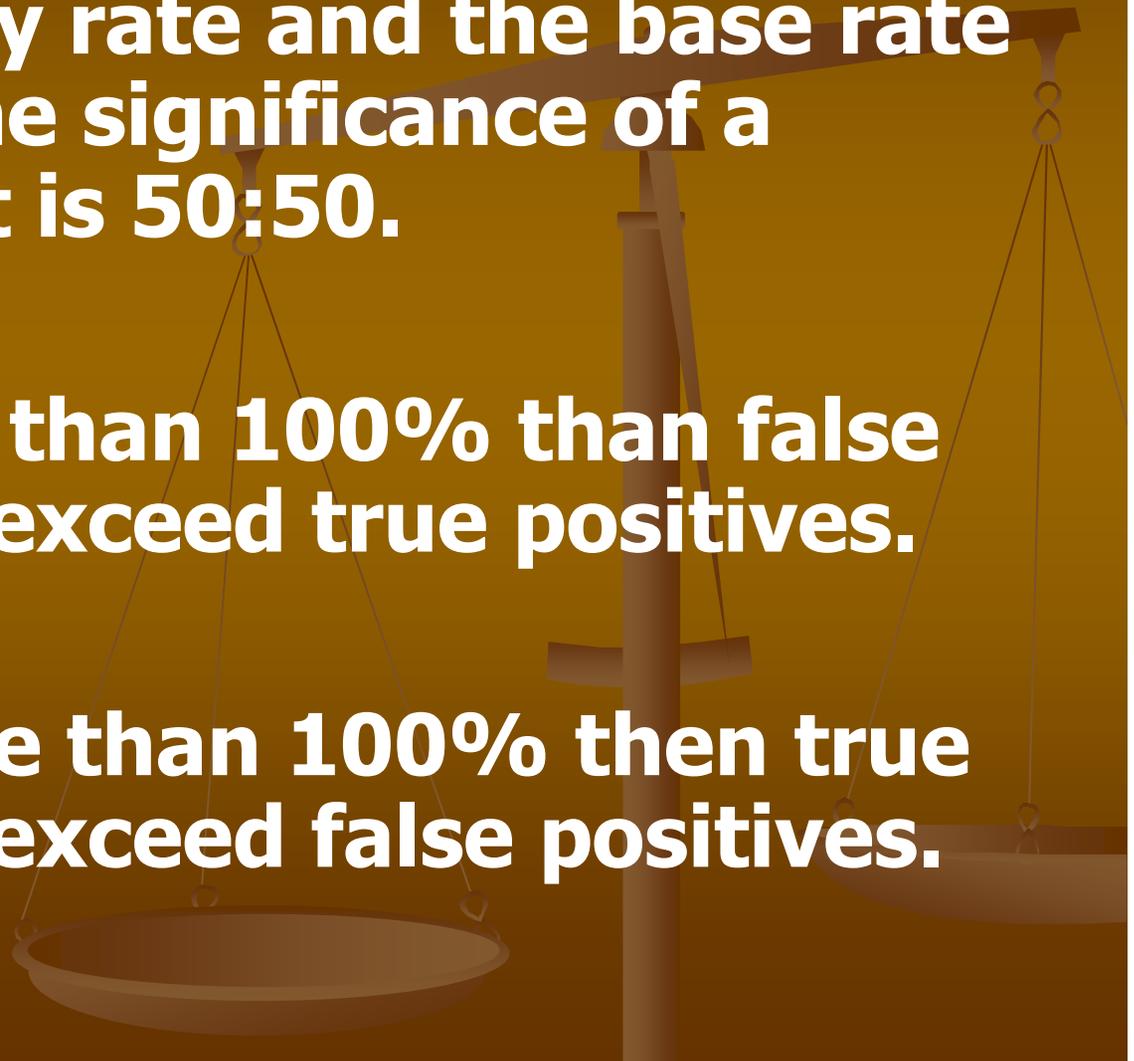
- Test HGN 77% accurate
DRE
 - If a driver is tested and the officer concludes the test is positive does that mean there is a 77% chance the driver is impaired? Is the officer is right?
 - Consider a 1000 drivers. How many will be impaired? Lets assume 23% or nearly 1/4. (You will see why I selected that particular % shortly.)
 - 23% impaired 230 impaired 770 not impaired
 - test is 77% accurate so of the 230 drivers that ARE in fact impaired
177 or 77% will be correctly identified by the test as impaired
53 or 23% will be Incorrectly identified by the test as impaired

and of the 770 drivers that are NOT in fact impaired
593 or 77% will be correctly identified as not impaired
177 or 23% will be Incorrectly identified as impaired
 - total drivers identified as impaired = 354
 - comprised 177 or 77% of the impaired drivers and 177 or 23% of the not-impaired drivers incorrectly identified
- 

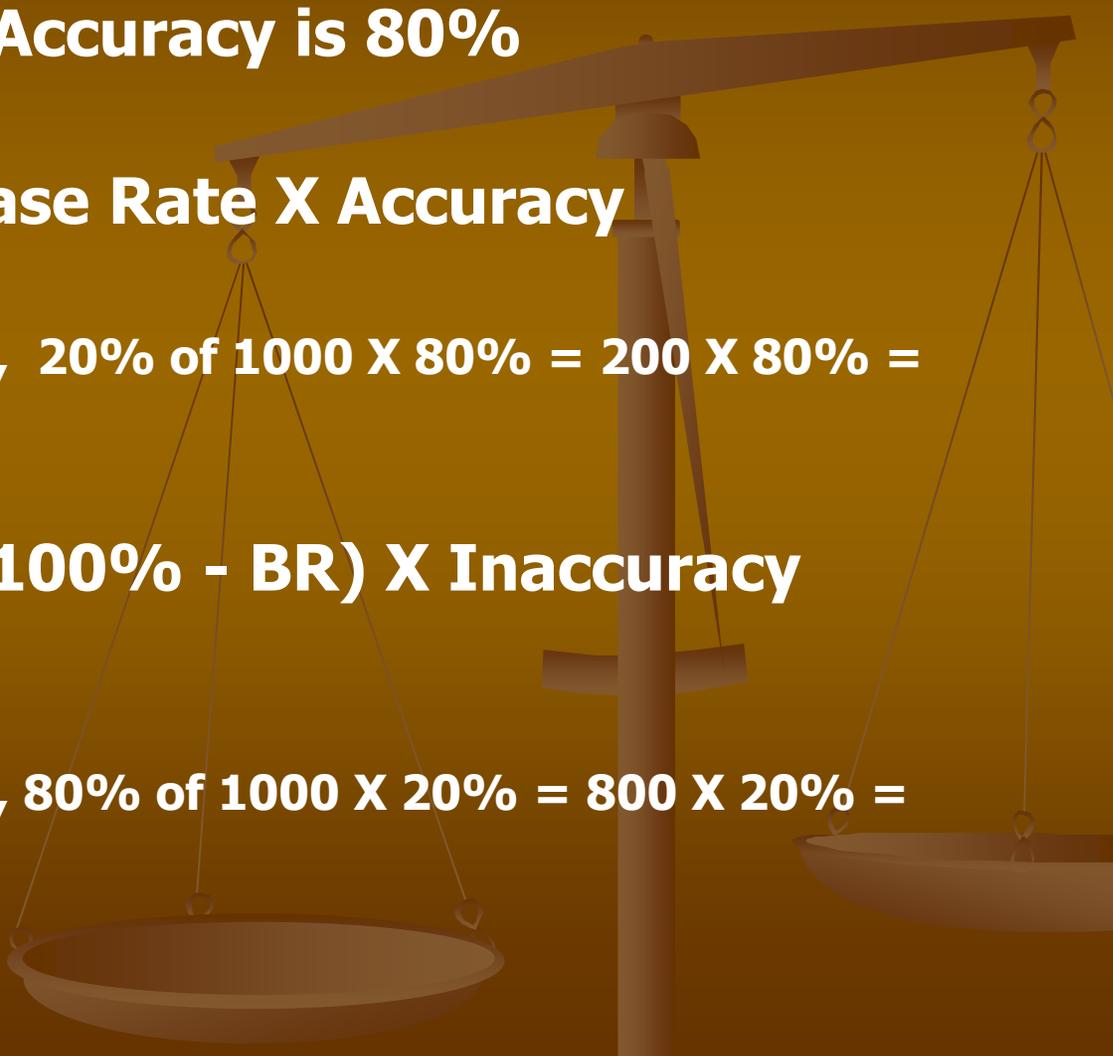
Rule of thumb is simple:

If the accuracy rate and the base rate total 100% the significance of a positive result is 50:50.

- If total is less than 100% than false positives will exceed true positives.
- If total is more than 100% then true positives will exceed false positives.

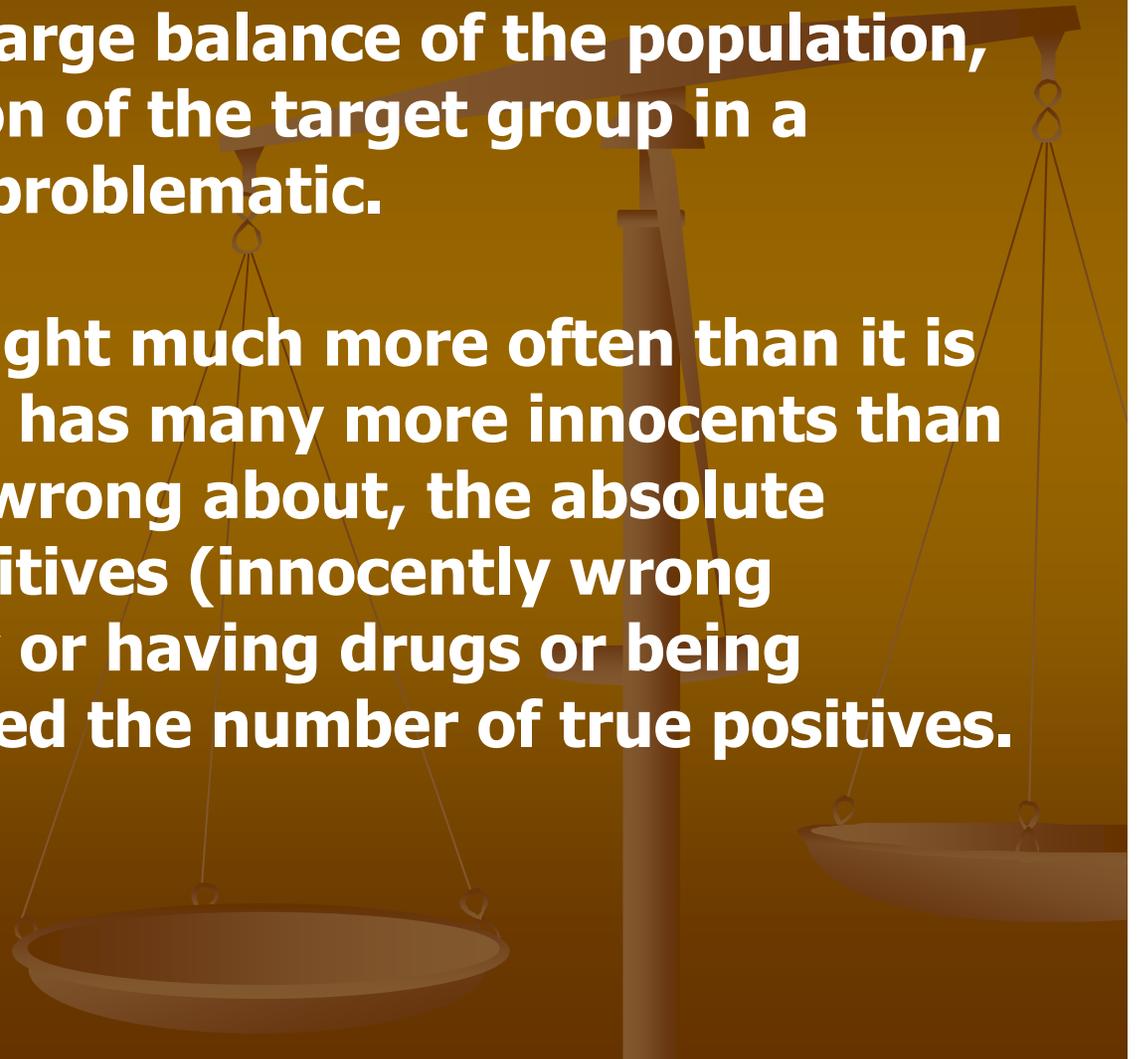


If the accuracy rate and the base rate total 100% the significance of a positive result is 50:50.

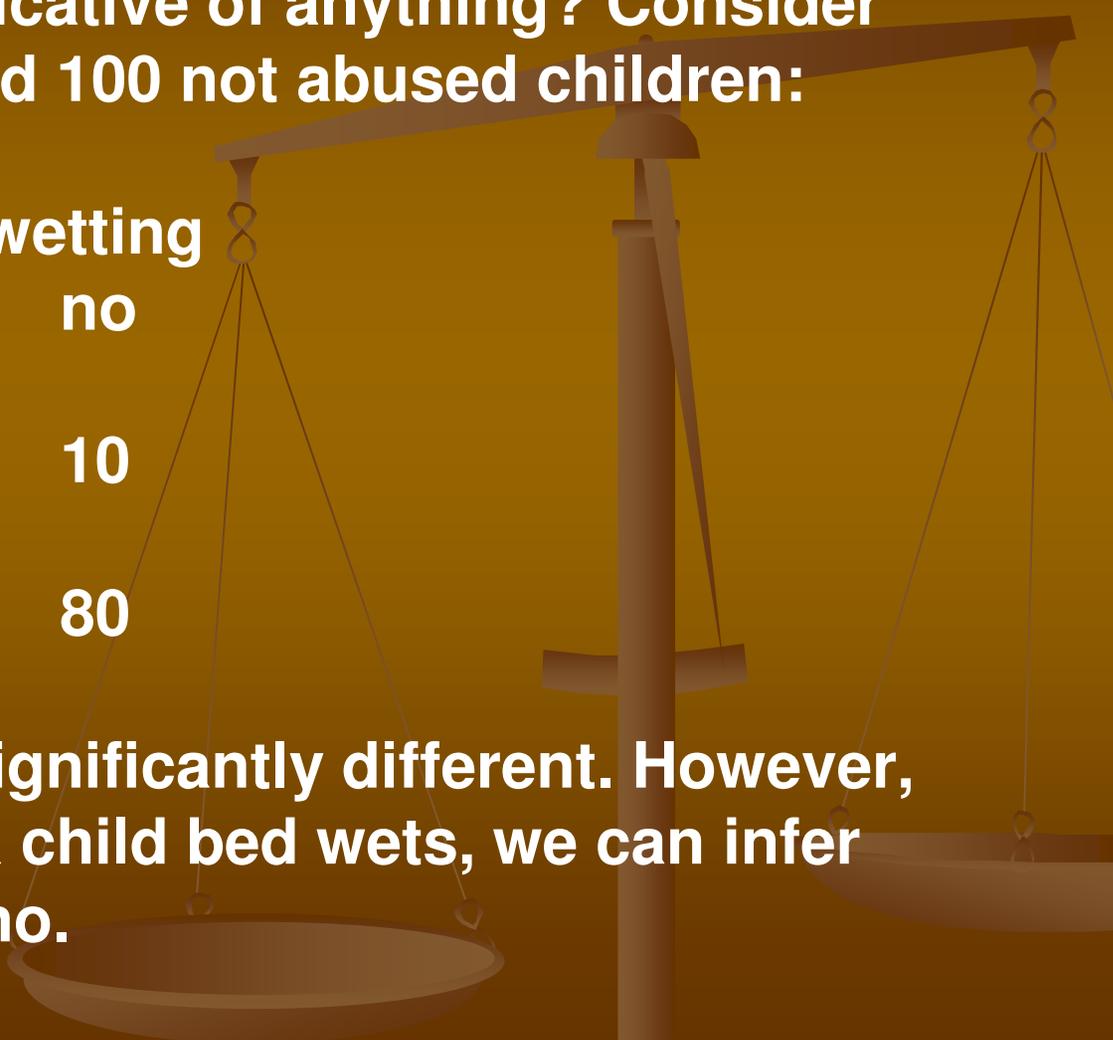
- **Base rate is 20%; Accuracy is 80%**
 - **True positives = Base Rate X Accuracy**
 - **For 1000 subjects, 20% of 1000 X 80% = 200 X 80% = 160**
 - **False positives = (100% - BR) X Inaccuracy (100% - Acc)**
 - **For 1000 subjects, 80% of 1000 X 20% = 800 X 20% = 160**
- 

Because of the base rate concept, even a high success rate in the context of a small subpopulation will give a smaller absolute number than the smaller failure rate for the large balance of the population, making the detection of the target group in a particular instance problematic.

The “test” may be right much more often than it is wrong, but where it has many more innocents than guilty people to be wrong about, the absolute number of false positives (innocently wrong mislabeled as guilty or having drugs or being terrorists) will exceed the number of true positives.



Assume 90 percent of abused children bed wet and only 20 percent of nonabused children bed wet. If a child bed wets, is it indicative of anything? Consider 100 abused children and 100 not abused children:

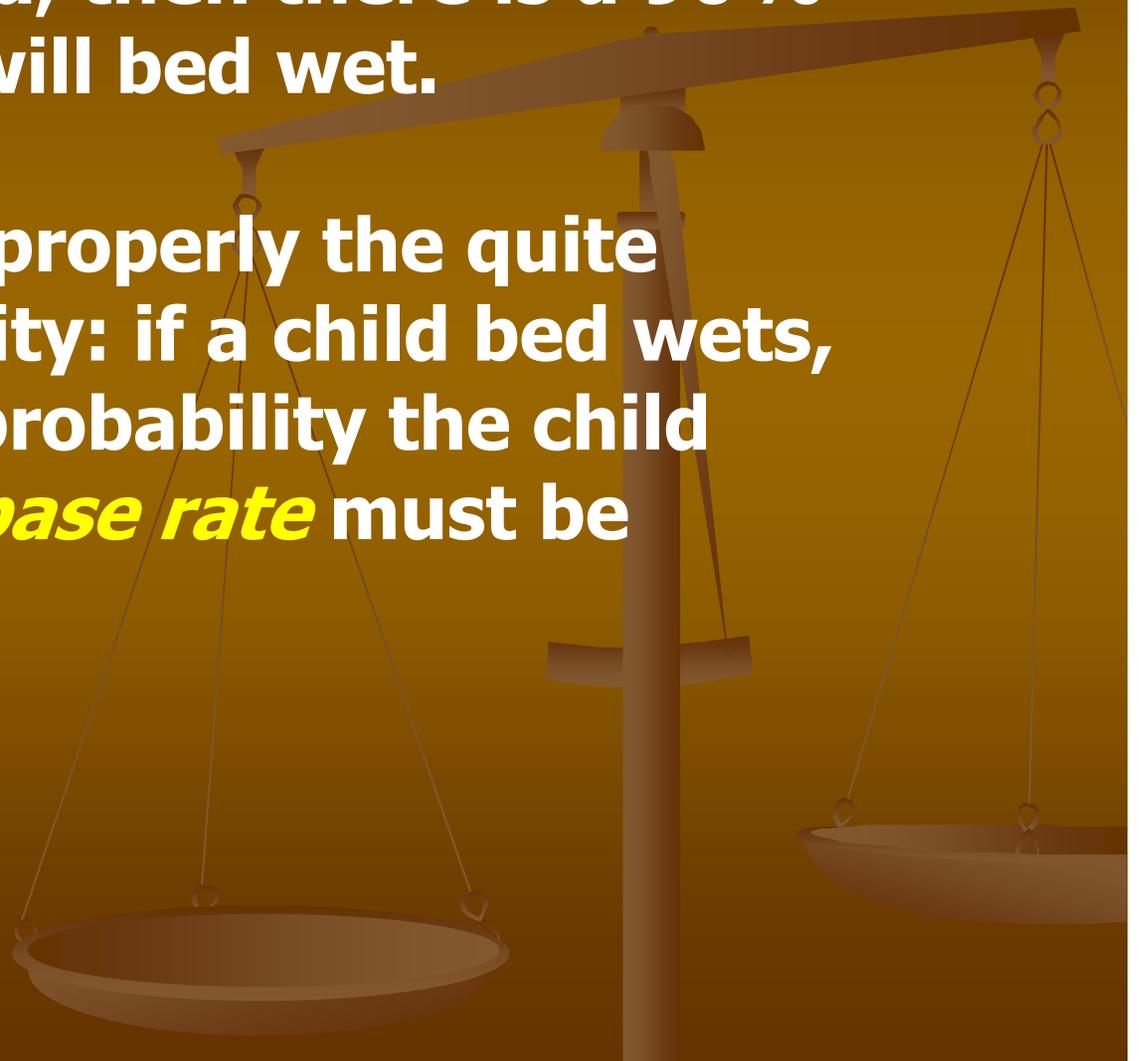


	bedwetting	
	yes	no
abused	90	10
not abused	20	80

The incidence seems significantly different. However, does this mean that if a child bed wets, we can infer abuse? The answer is no.

If a child is abused, then there is a 90% chance the child will bed wet.

But to determine properly the quite different probability: if a child bed wets, then what is the probability the child was abused, the *base rate* must be considered.



Assume a base rate of 10 percent; that is, 10 percent of children selected at random would be abused. Now consider a population of 100 children where we do not know whether any particular individual child is abused or not. Ten percent on average will be abused, which equals 10 children; 90 will not be abused. Of the 10 abused, 90 percent or 9 will bed wet; of the 90 not abused, 20 percent or 18 will bed wet.

So of the 100 children, 27 ($9 + 18 = 27$) will bed wet, but only 9 out of these 27 will be abused, and 18 of 27 will not be abused.

So with respect to a given child who bed wets, we do not know whether the child is one of the 9 abused or the 18 not abused, so the odds are 2:1 that the child is not abused.

In short, there is all the difference in the world between the probabilities: “Given the child was abused it will bed wet”, which is 90 percent, and “Given the child bed wets it was abused”, which is 33 percent.

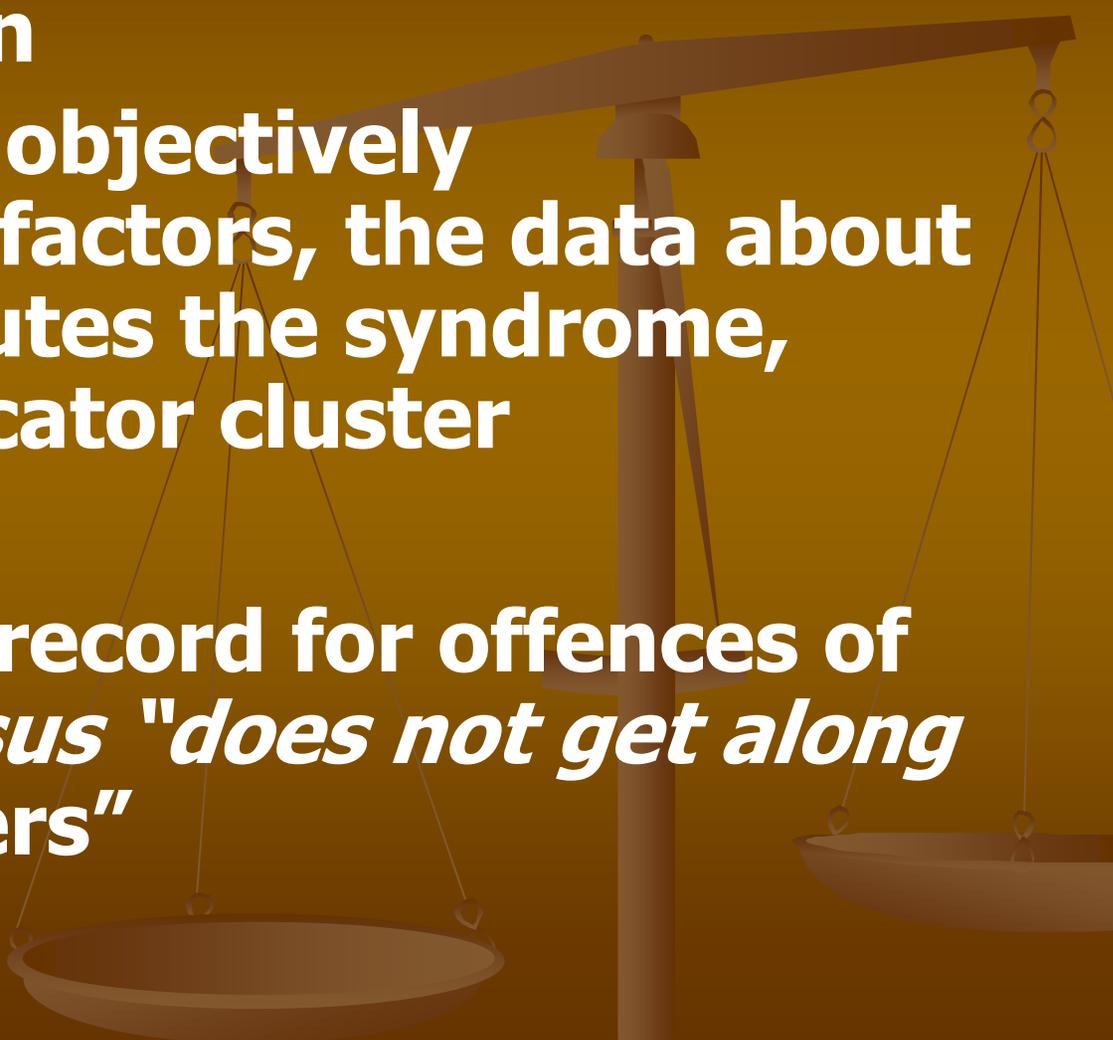
Note that in our hypothetical the fact that the child bed wets does change the probabilities.

The probability the child is abused went from 1 in 10 to 1 in 3 because of the additional fact of bedwetting. This is a reflection of the difference in the proportion of abused, versus nonabused children who bed wet. But the fact of bed wetting does not make it more probable than not that the child is abused.

In real life the evidence should be inadmissible because we lack the data necessary to make a similar proper evidentiary assessment:

- we do not know the base rate for abused children;**
- we do not know the proportion of abused children who bed wet; and**
- we do not know the proportion of nonabused children who bed wet**

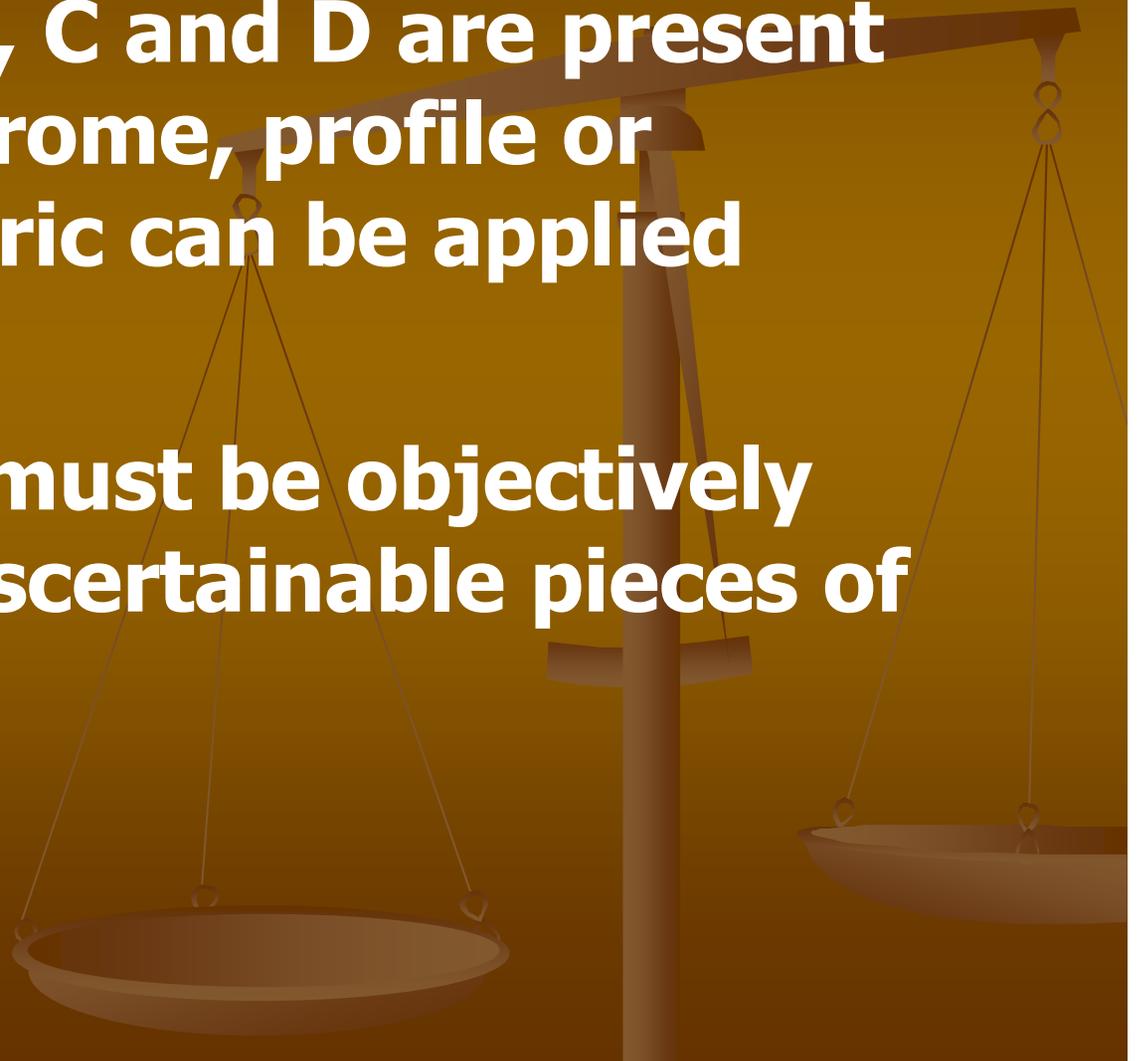
The Scientific Approach



- **Data collection**
 - describe the objectively ascertainable factors, the data about which constitutes the syndrome, profile or indicator cluster
- e.g. "criminal record for offences of violence" *versus* "does not get along well with others"

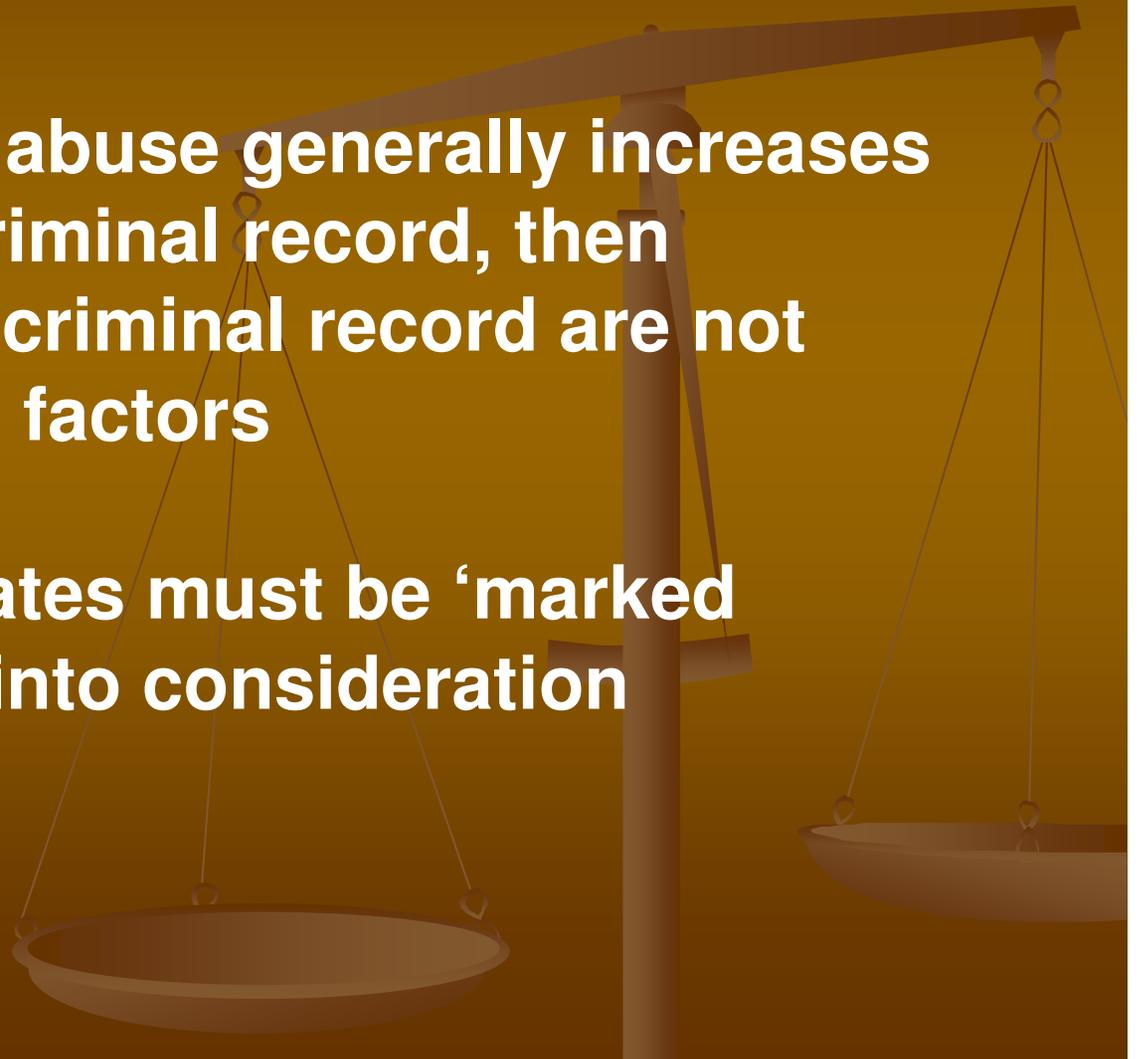
Define your criteria

- **If factors A, B, C and D are present then the syndrome, profile or indicators rubric can be applied**
- **A, B, C and D must be objectively defined and ascertainable pieces of data**



Consider the independence *versus the* interrelationship between the factors

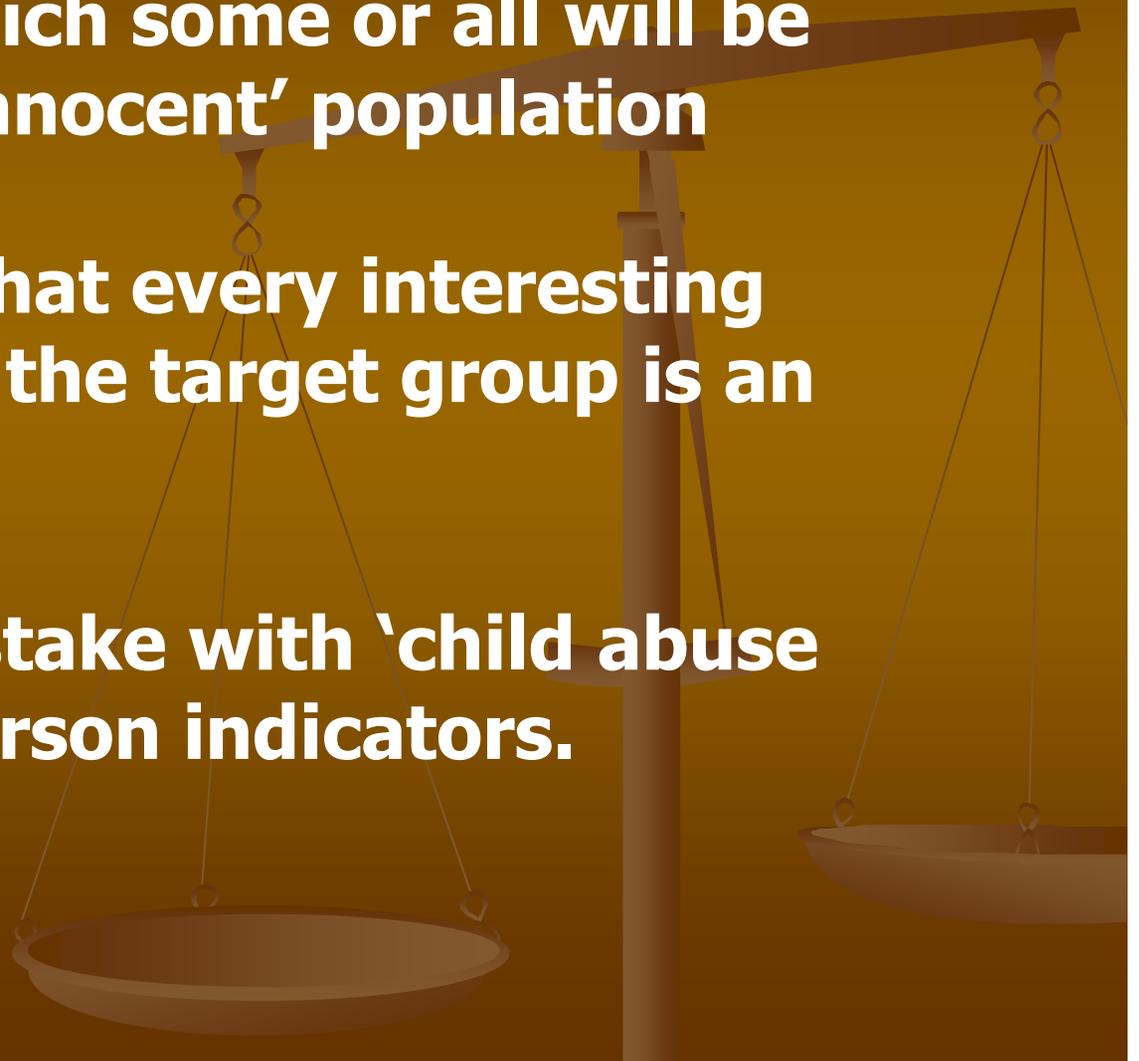
- If alcohol or drug abuse generally increases the chances of a criminal record, then alcohol abuse and criminal record are not really two separate factors
- Probability estimates must be 'marked down' to take that into consideration



**Consider the base rate of the factors,
the extent to which some or all will be
present in the 'innocent' population**

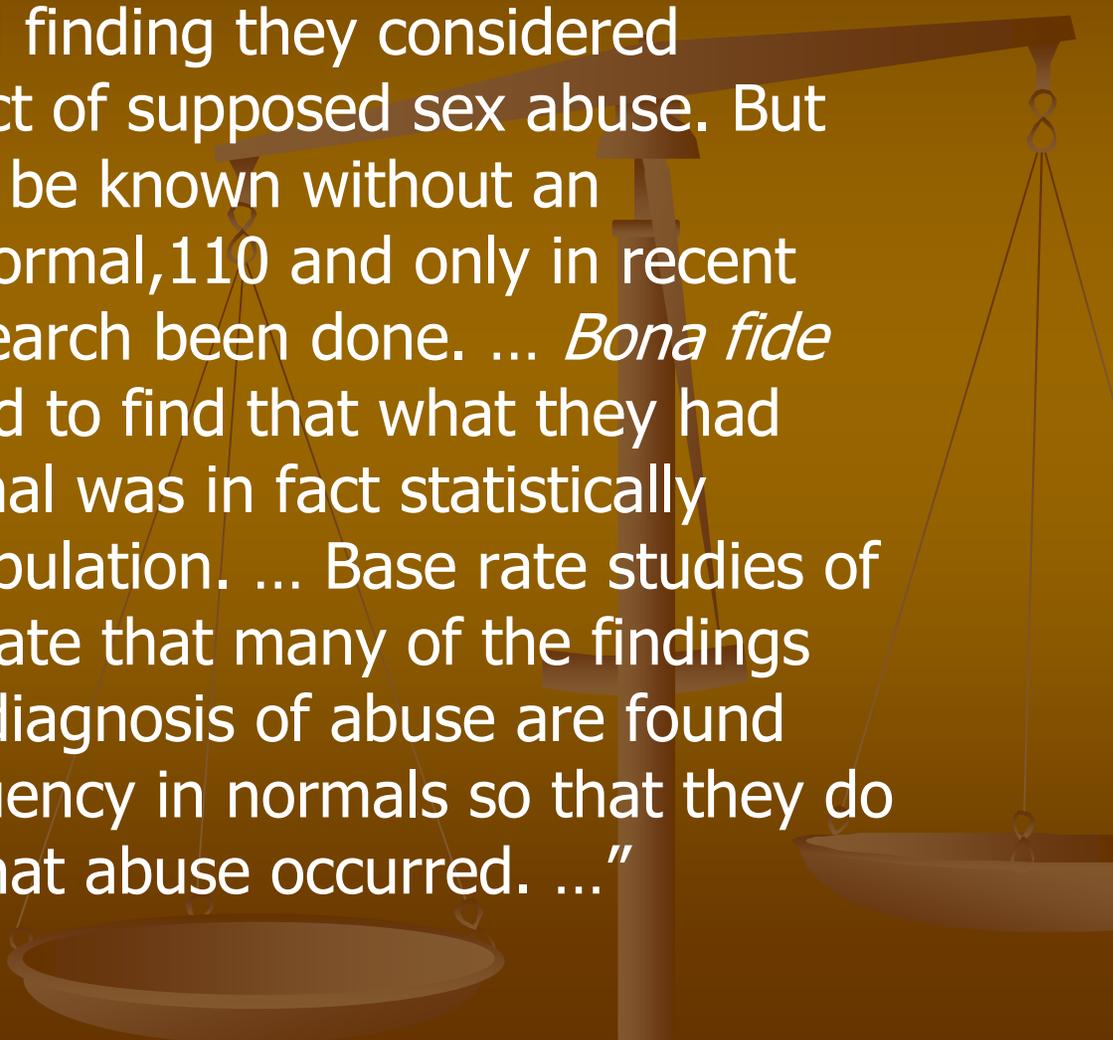
**Do not assume that every interesting
characteristic of the target group is an
identifier.**

**This was the mistake with 'child abuse
indicators' and arson indicators.**



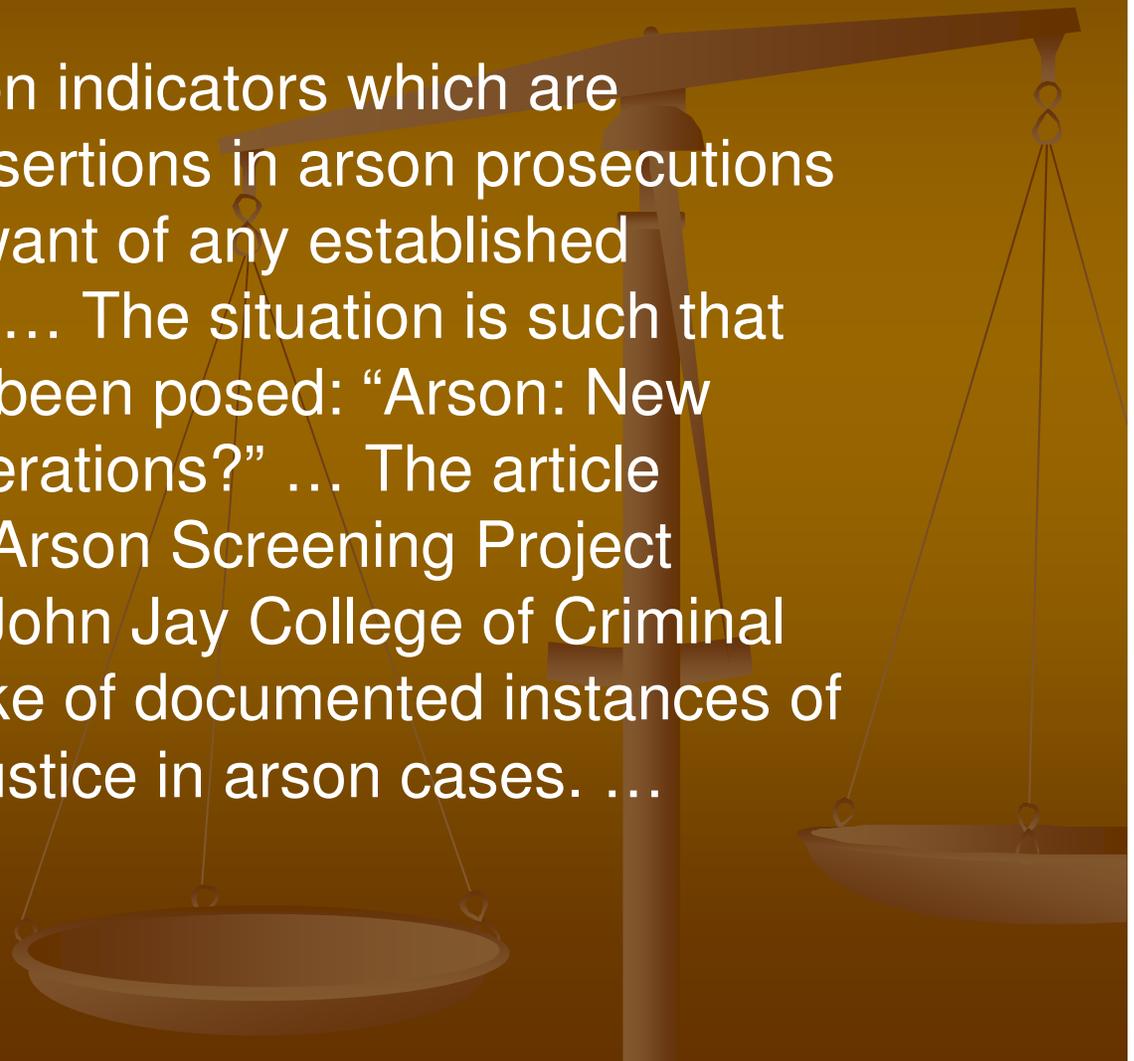
Child Abuse Indicators

“For the longest time, prosecution experts were prepared to state that any physical finding they considered abnormal was the product of supposed sex abuse. But what is abnormal cannot be known without an examination of what is normal,¹¹⁰ and only in recent years has such basic research been done. ... *Bona fide* researchers were shocked to find that what they had been considering abnormal was in fact statistically normal in the general population. ... Base rate studies of nonabused children indicate that many of the findings often used to support a diagnosis of abuse are found with a high enough frequency in normals so that they do not support an opinion that abuse occurred. ...”



Arson Indicators

“Many of the arson indicators which are commonplace assertions in arson prosecutions are deficient for want of any established scientific validity. ... The situation is such that the question has been posed: “Arson: New Frontier for Exonerations?” ... The article describes a new Arson Screening Project launched by the John Jay College of Criminal Justice in the wake of documented instances of miscarriages of justice in arson cases. ...

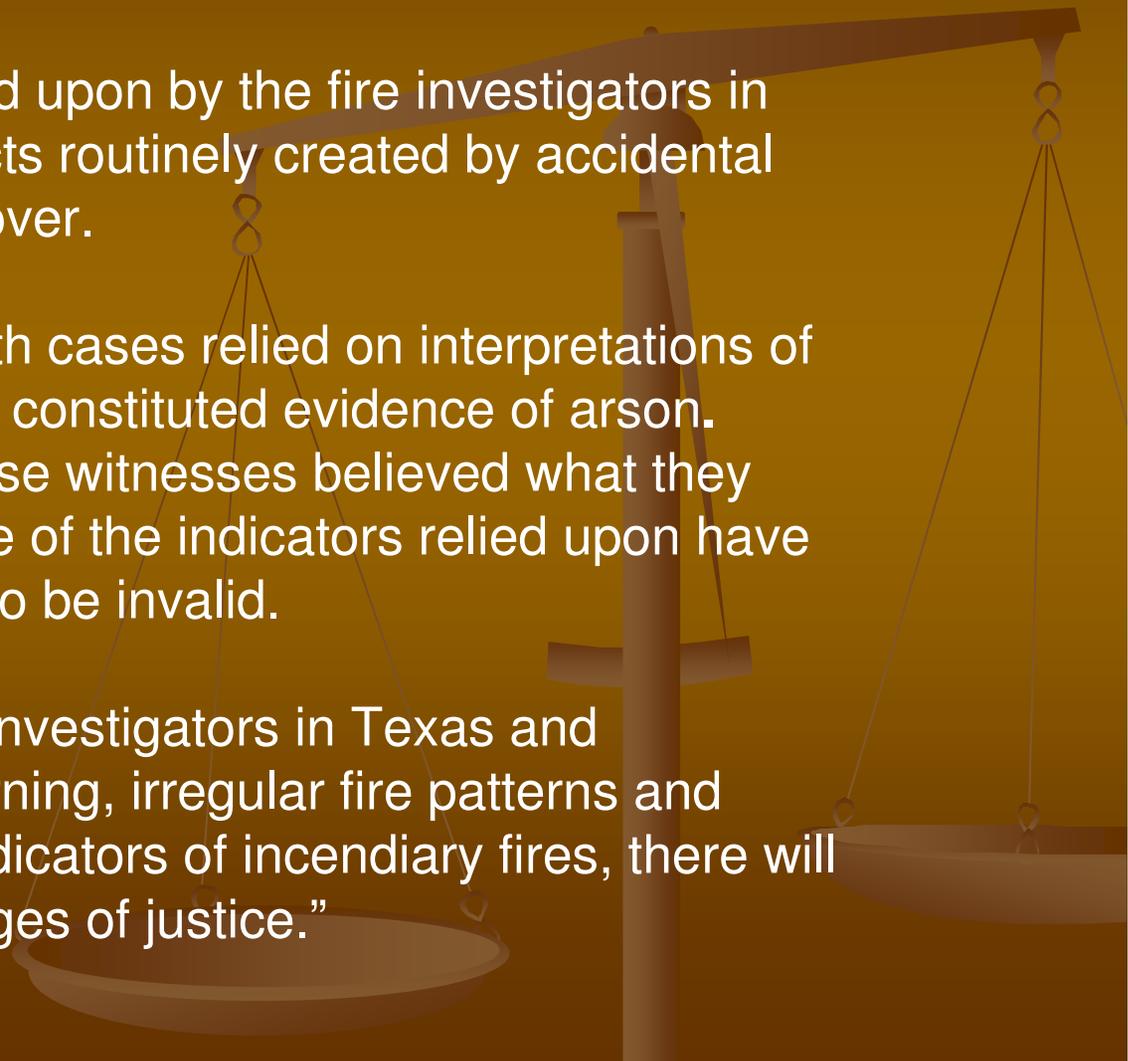


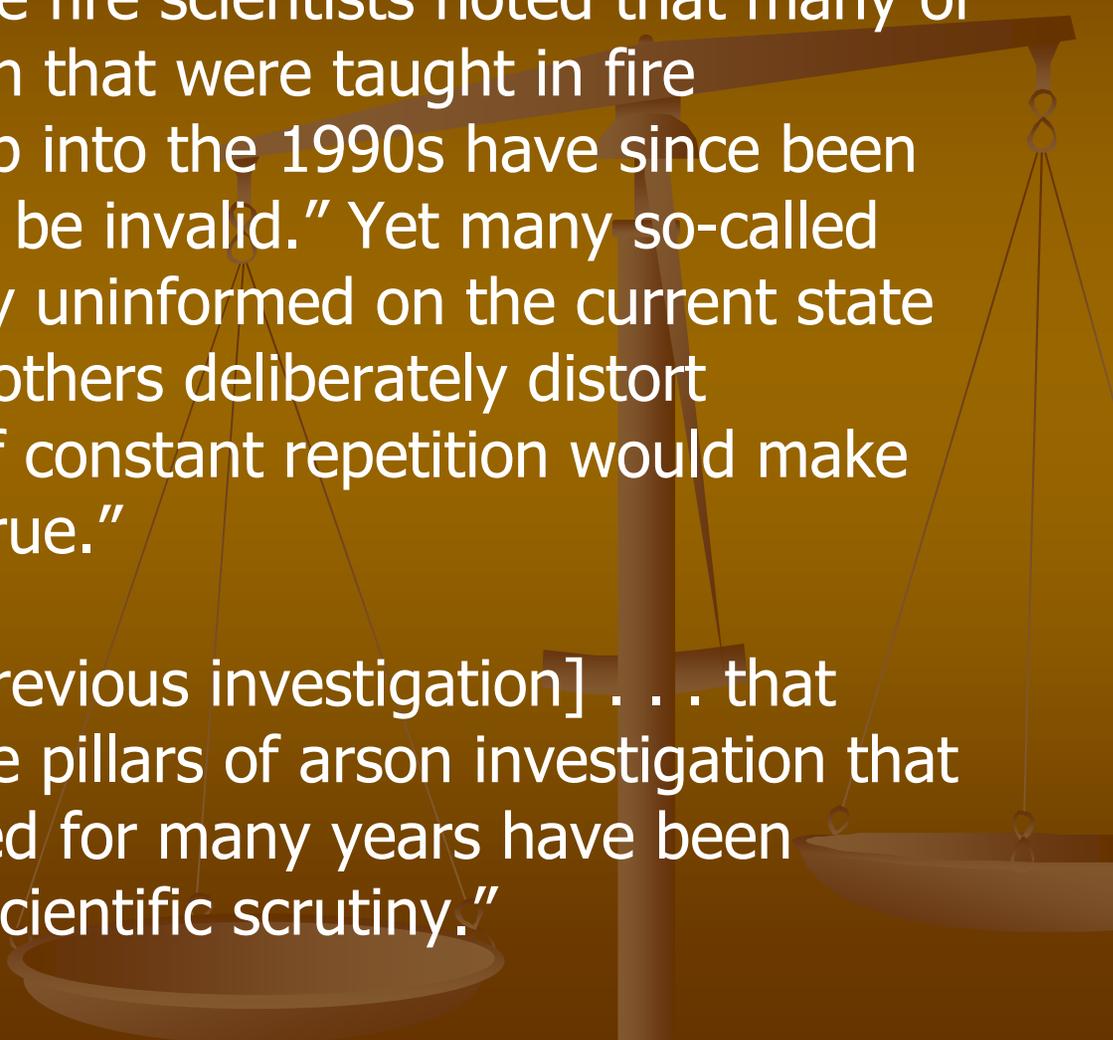
In one case in Texas the death penalty resulted in a case that one arson expert described as follows: “Neither the fire that killed the three Willingham children nor the fire that killed Elizabeth Grace Belue and Gail Joe Allison were incendiary fires.

The artifacts examined and relied upon by the fire investigators in both cases are the kind of artifacts routinely created by accidental fires that progress beyond flashover.

The State’s expert witness in both cases relied on interpretations of ‘indicators’ that they were taught constituted evidence of arson. While we have no doubt that these witnesses believed what they were saying, each and every one of the indicators relied upon have since been scientifically proven to be invalid.

To the extent that there are still investigators in Texas and elsewhere, who interpret low burning, irregular fire patterns and collapsed furniture springs as indicators of incendiary fires, there will continue to be serious miscarriages of justice.”





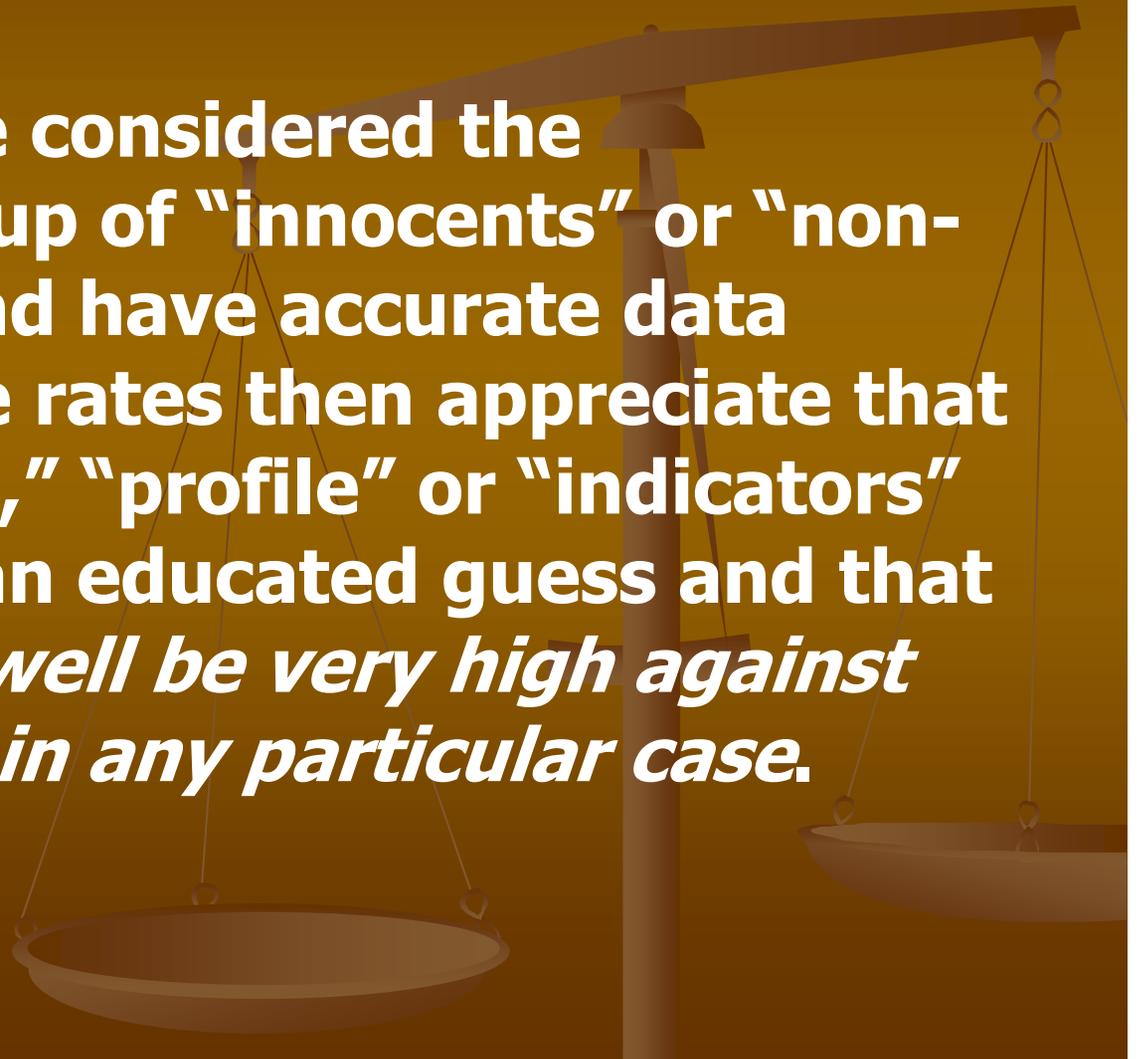
In another case, the accused was exonerated after a panel of fire experts working *pro bono* for the Innocence Project concluded that both fires were accidental.

In their peer review, the fire scientists noted that many of the “indicators” of arson that were taught in fire investigation courses up into the 1990s have since been “scientifically proven to be invalid.” Yet many so-called experts remain woefully uninformed on the current state of the science. Worse, others deliberately distort science, behaving “as if constant repetition would make [their false] assertion true.”

The report echoes a [previous investigation] . . . that found that “many of the pillars of arson investigation that were commonly believed for many years have been disproved by rigorous scientific scrutiny.”

Conclusion

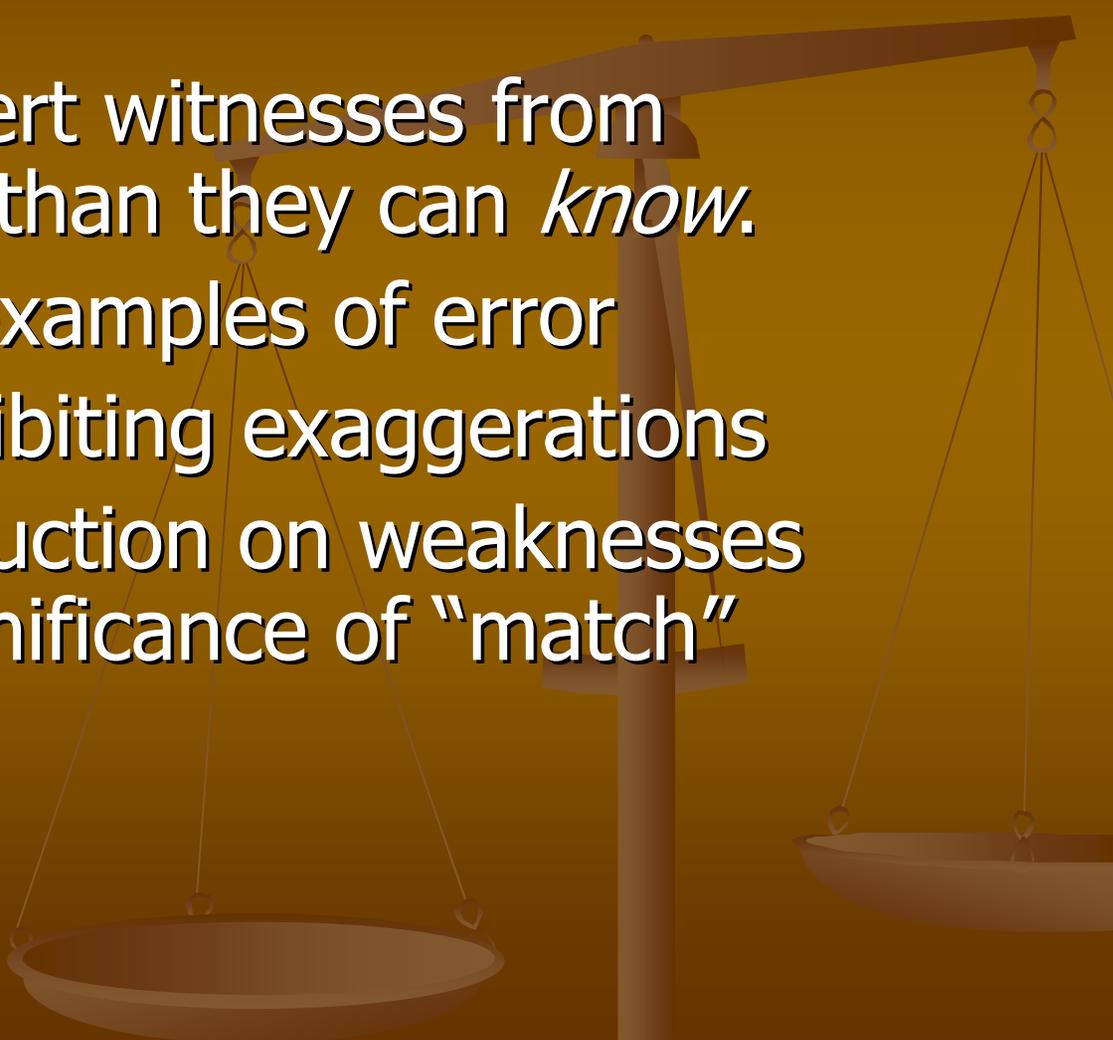
- Unless you have considered the comparison group of “innocents” or “non-target” cases and have accurate data concerning base rates then appreciate that your “syndrome,” “profile” or “indicators” may be simply an educated guess and that *the odds could well be very high against you being right in any particular case.*



What to do?



In arguing for exclusion of prosecutors expert

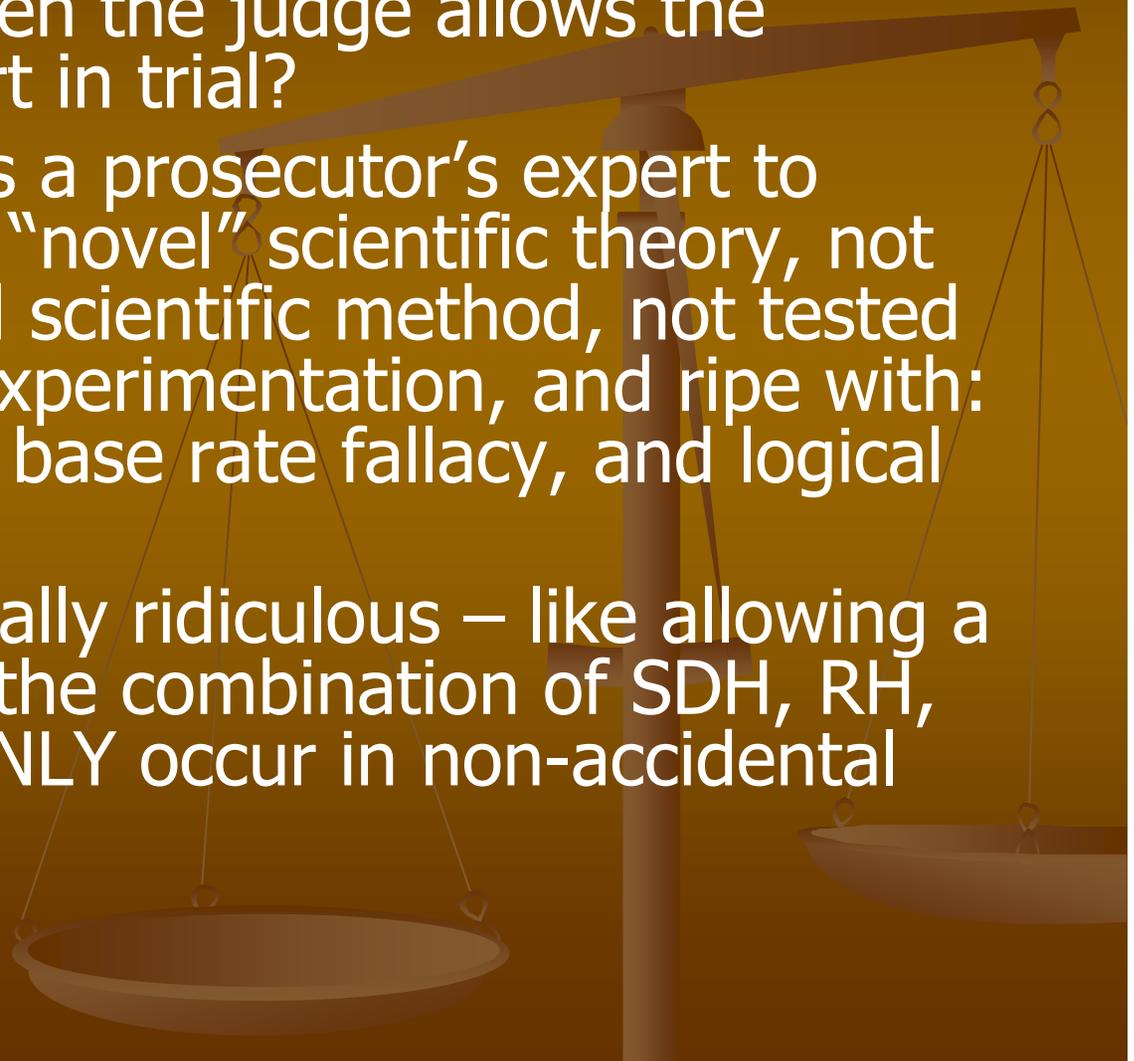
- Goal: Prevent expert witnesses from testifying to more than they can *know*.
 - Provide concrete examples of error
 - Obtain ruling prohibiting exaggerations
 - Obtain a jury instruction on weaknesses of "science" or significance of "match"
- 

In arguing for exclusion of prosecutors expert

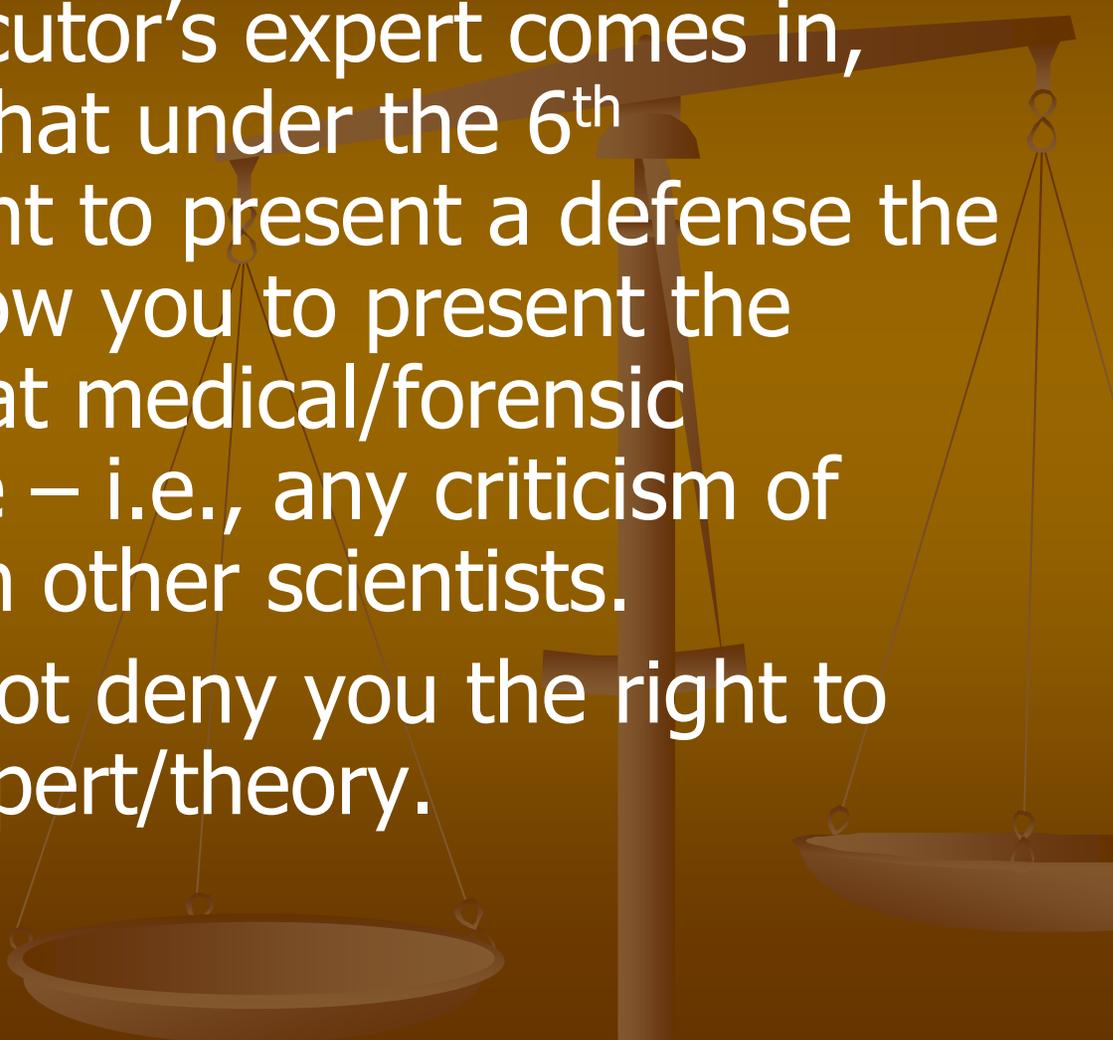
- Contrast the treatment of experts when the courts when dealing with civil cases. *See e.g., Gilbert v DaimlerChrysler Corp, 470 Mich. 749, 685 N.W.2d 391 (2004)*
- NSA report specifically found that trial judges rarely bared novel scientific testimony from Prosecutors, and rarely allowed it from the Defense.

Refuting Prosecutor's expert

- What happens when the judge allows the prosecutor's expert in trial?
- If the judge allows a prosecutor's expert to testify as to some "novel" scientific theory, not based on the valid scientific method, not tested with falsification experimentation, and ripe with: confirmation bias, base rate fallacy, and logical inconsistency.
- Say, something really ridiculous – like allowing a Dr. to testify that the combination of SDH, RH, and Edema can ONLY occur in non-accidental trauma.....



Rebuttal



- Once the Prosecutor's expert comes in, you can argue that under the 6th Amendment right to present a defense the judge **MUST** allow you to present the other side of that medical/forensic scientific debate – i.e., any criticism of that theory from other scientists.
- The Judge cannot deny you the right to present your expert/theory.

Go Get 'Em

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