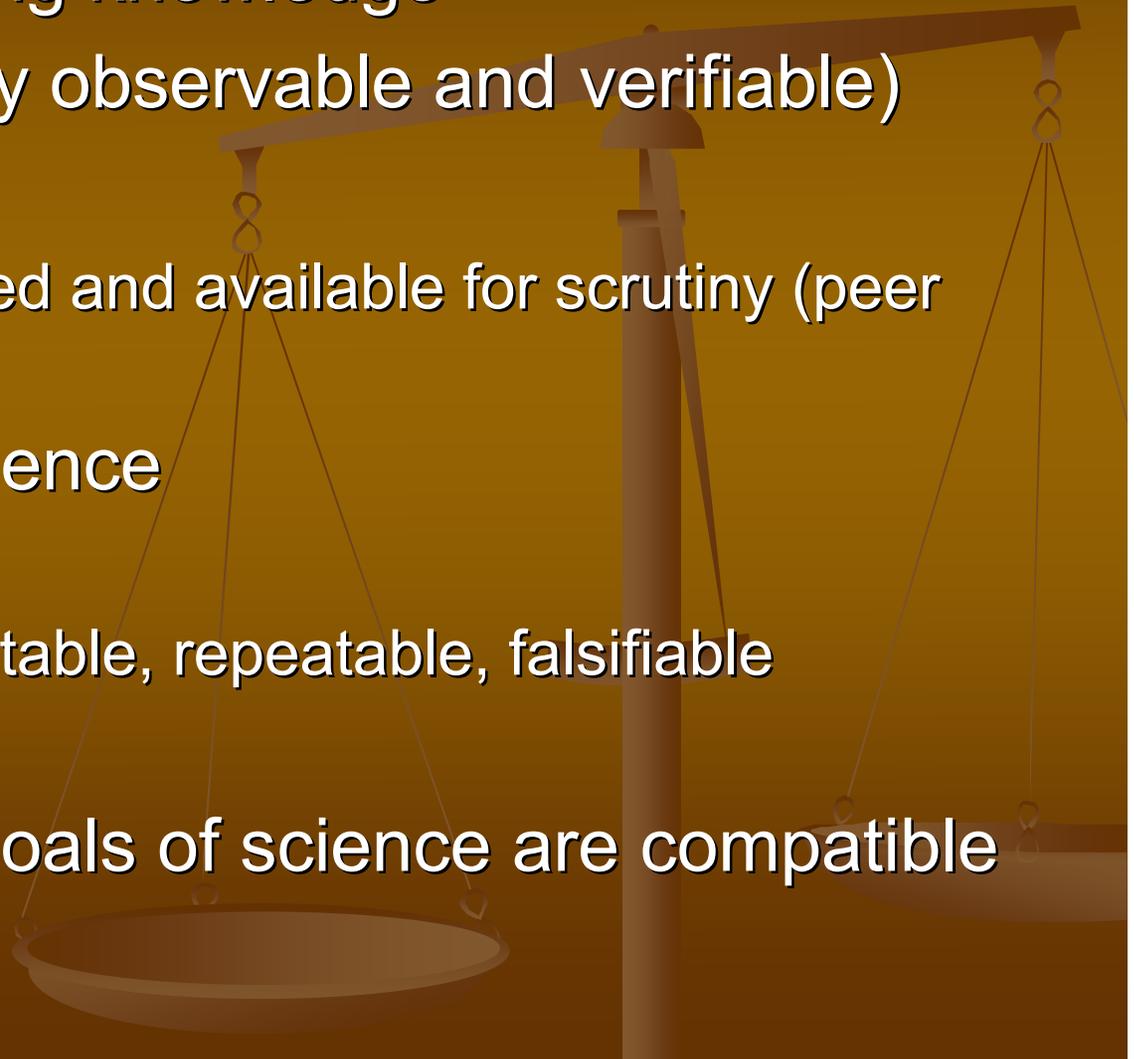


Scientific Evidence in Court



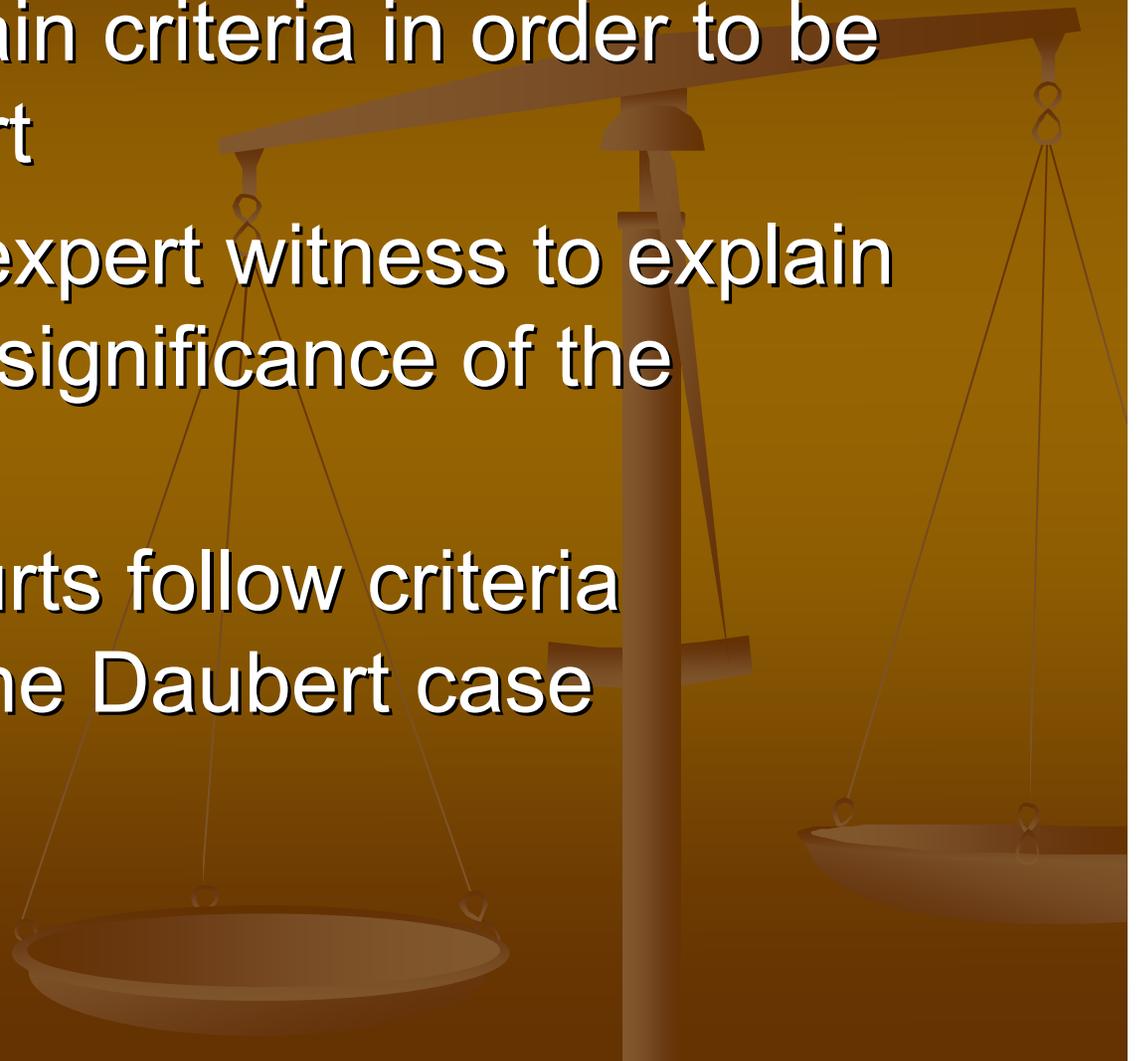
Science

- A system of acquiring knowledge
- Objective (externally observable and verifiable)
- Transparent
 - Results are published and available for scrutiny (peer review)
- Uses empirical evidence
 - Scientific method
 - Conclusions are testable, repeatable, falsifiable
- The structure and goals of science are compatible with truth

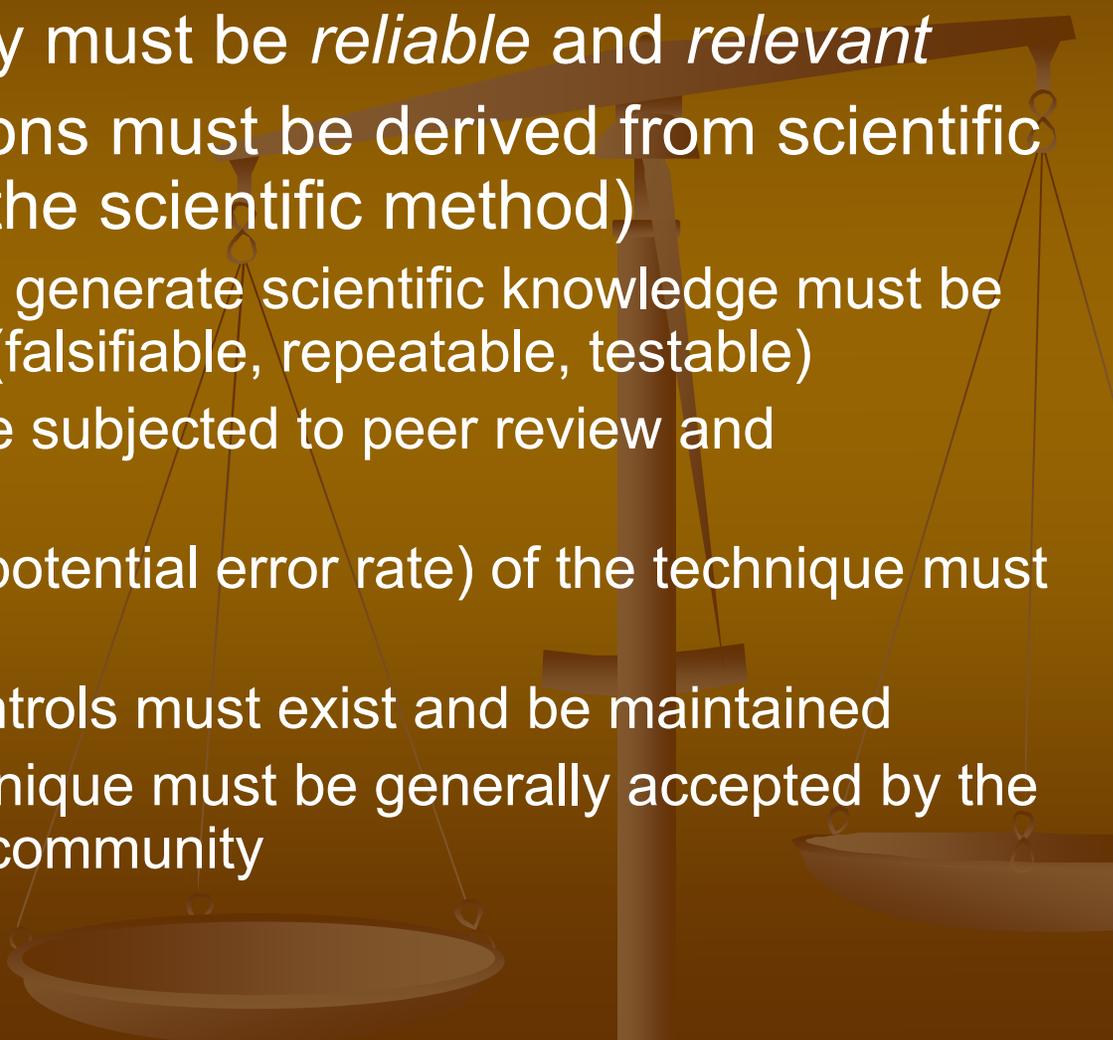


Scientific Evidence

- Must meet certain criteria in order to be admitted in court
- Often requires expert witness to explain the meaning or significance of the evidence
- In US, most courts follow criteria established in the Daubert case



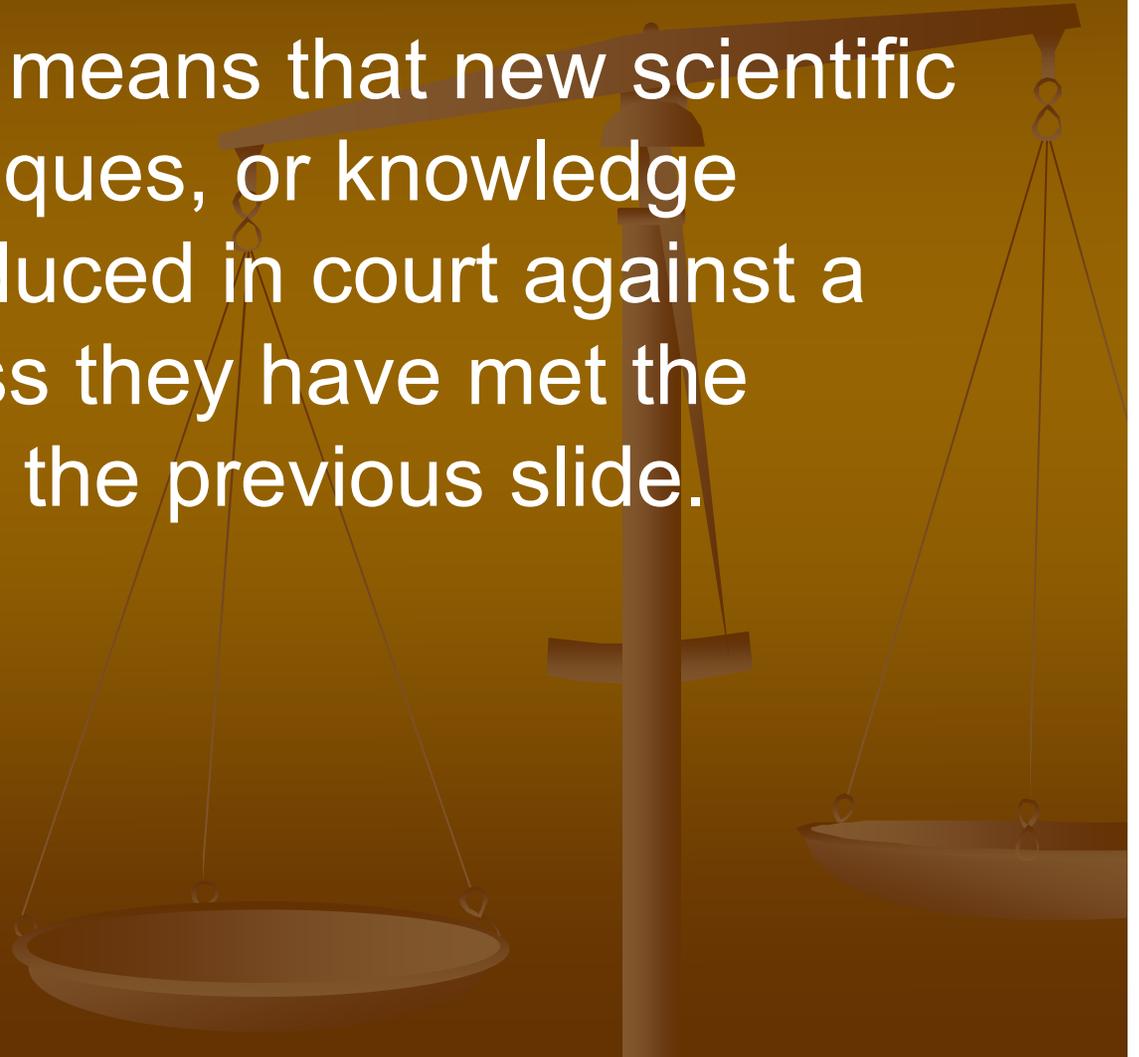
Daubert



- *Daubert v Merrell Dow Pharmaceuticals, 1993*
 - Scientific testimony must be *reliable and relevant*
 - Scientific conclusions must be derived from scientific methodology (i.e, the scientific method)
 - Technique used to generate scientific knowledge must be empirically tested (falsifiable, repeatable, testable)
 - Technique must be subjected to peer review and publication
 - The error rate (or potential error rate) of the technique must be known
 - Standards and controls must exist and be maintained
 - The theory or technique must be generally accepted by the relevant scientific community

Daubert

- This essentially means that new scientific methods, techniques, or knowledge cannot be introduced in court against a defendant unless they have met the criteria listed on the previous slide.

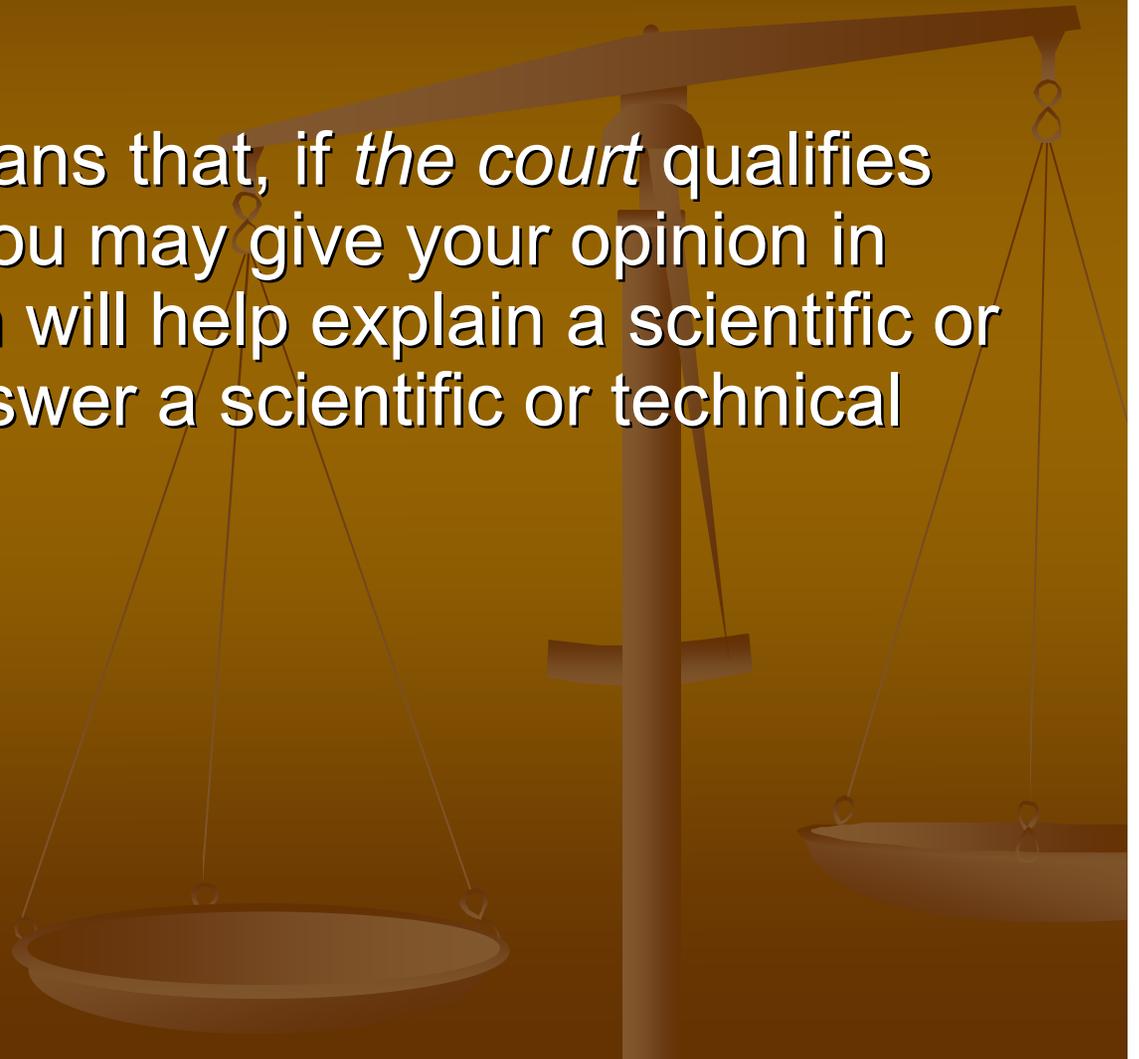


Federal Rule of Evidence 702 (Expert Witness)

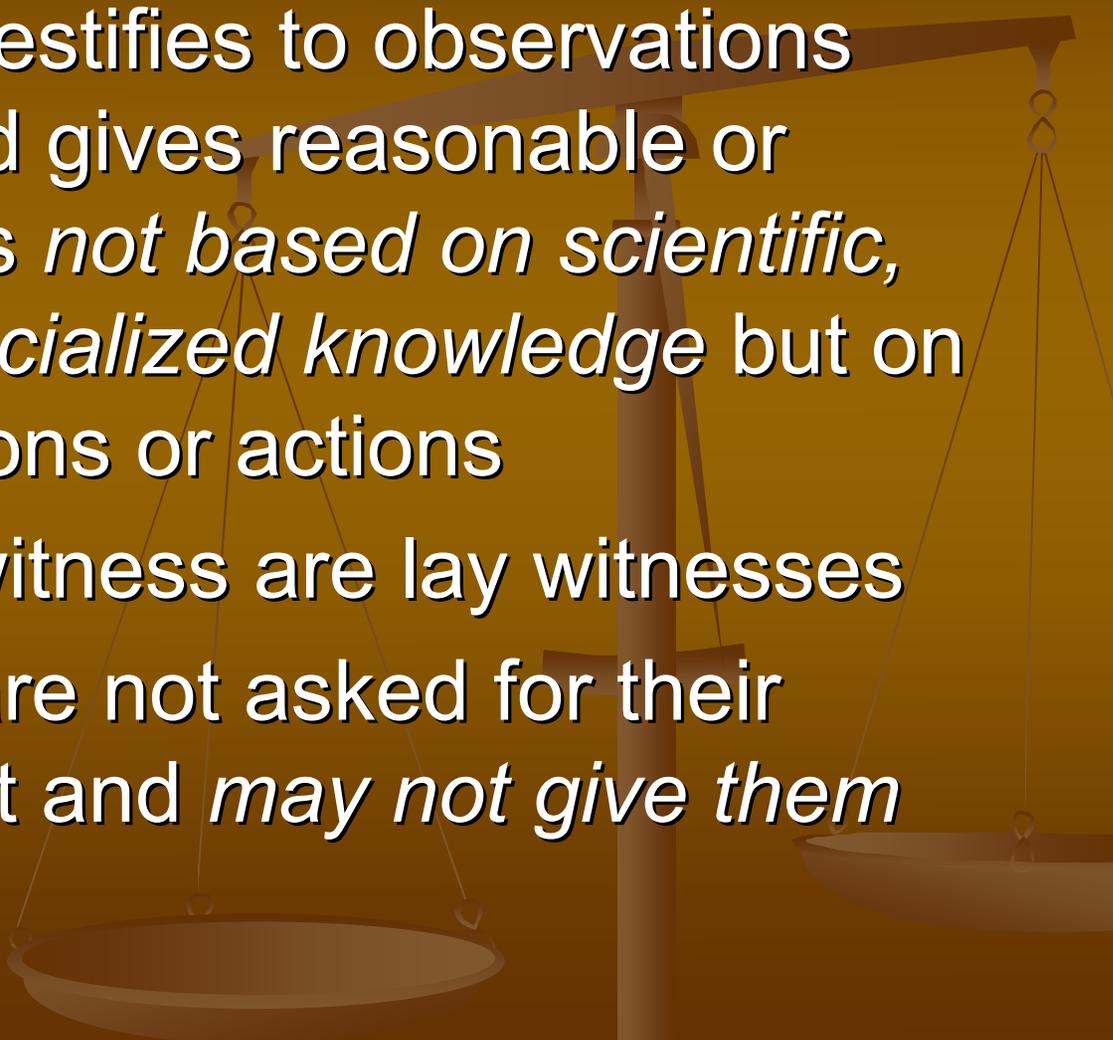
- If scientific, technical, or other specialized knowledge will assist the trier of fact (judge or jury) to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training or education may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case.

Federal Rule of Evidence 702 (Expert Witness)

- This essentially means that, if *the court* qualifies you as an expert, you may give your opinion in court if your opinion will help explain a scientific or technical fact or answer a scientific or technical question

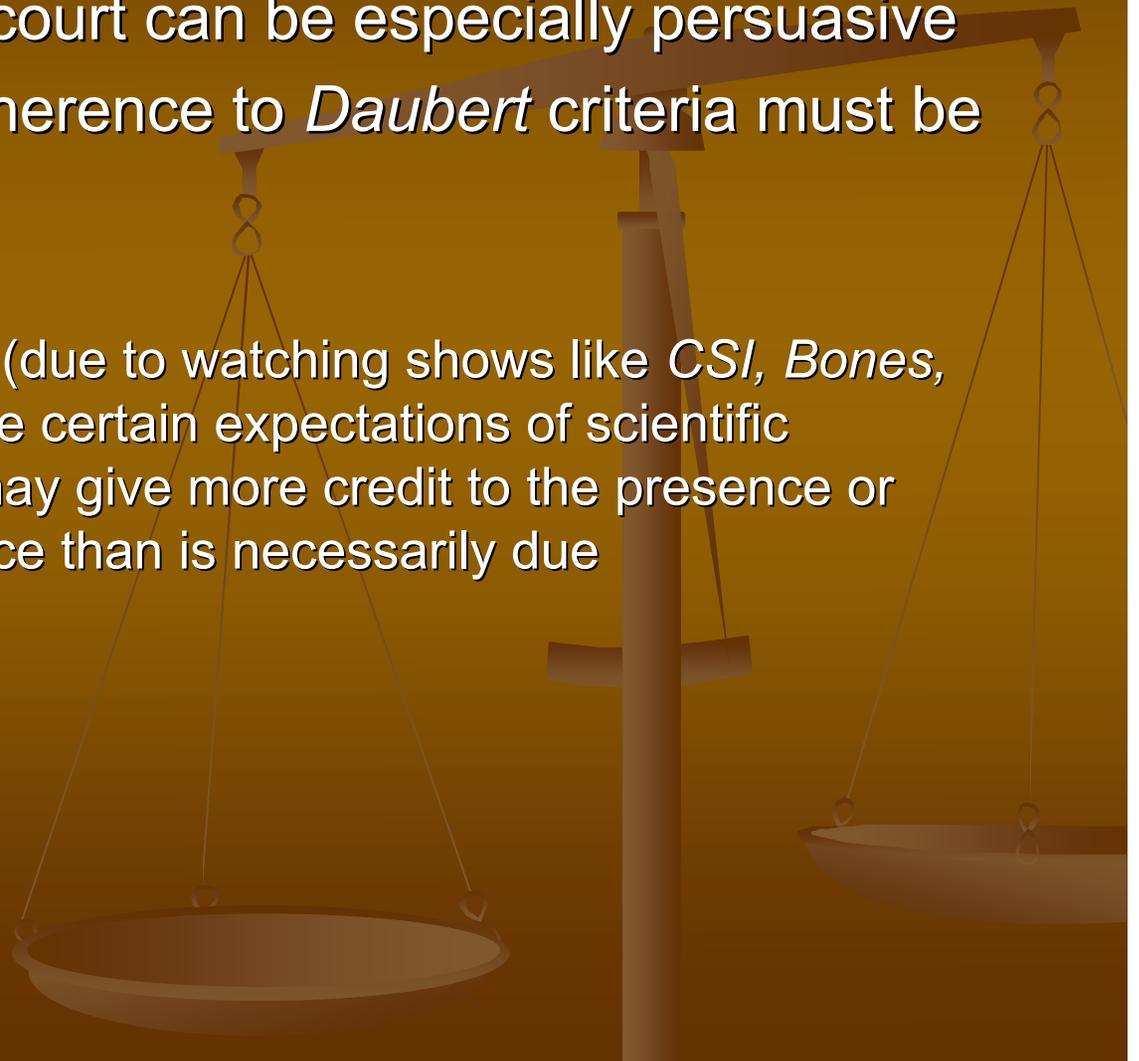


What is a lay witness?

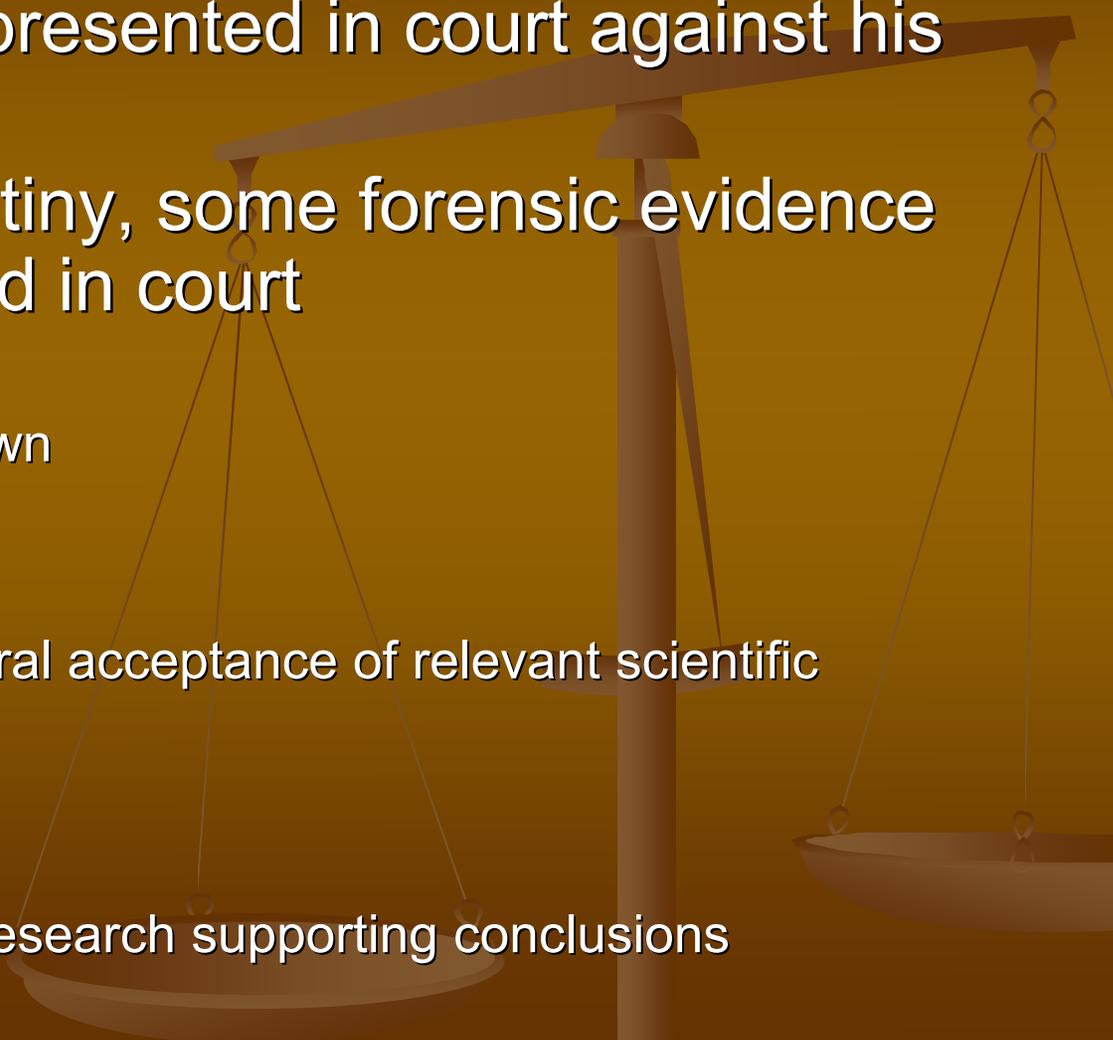
- A witness who testifies to observations and actions, and gives reasonable or rational opinions *not based on scientific, technical or specialized knowledge* but on those observations or actions
 - All non-expert witness are lay witnesses
 - Lay witnesses are not asked for their opinions in court and *may not give them*
- 

Scientific Evidence

- Scientific evidence in court can be especially persuasive
- For this reason, its adherence to *Daubert* criteria must be monitored
- CSI Effect
 - This theory claims that (due to watching shows like *CSI*, *Bones*, etc.) modern juries have certain expectations of scientific evidence at trial, and may give more credit to the presence or absence of that evidence than is necessarily due



Scientific Evidence



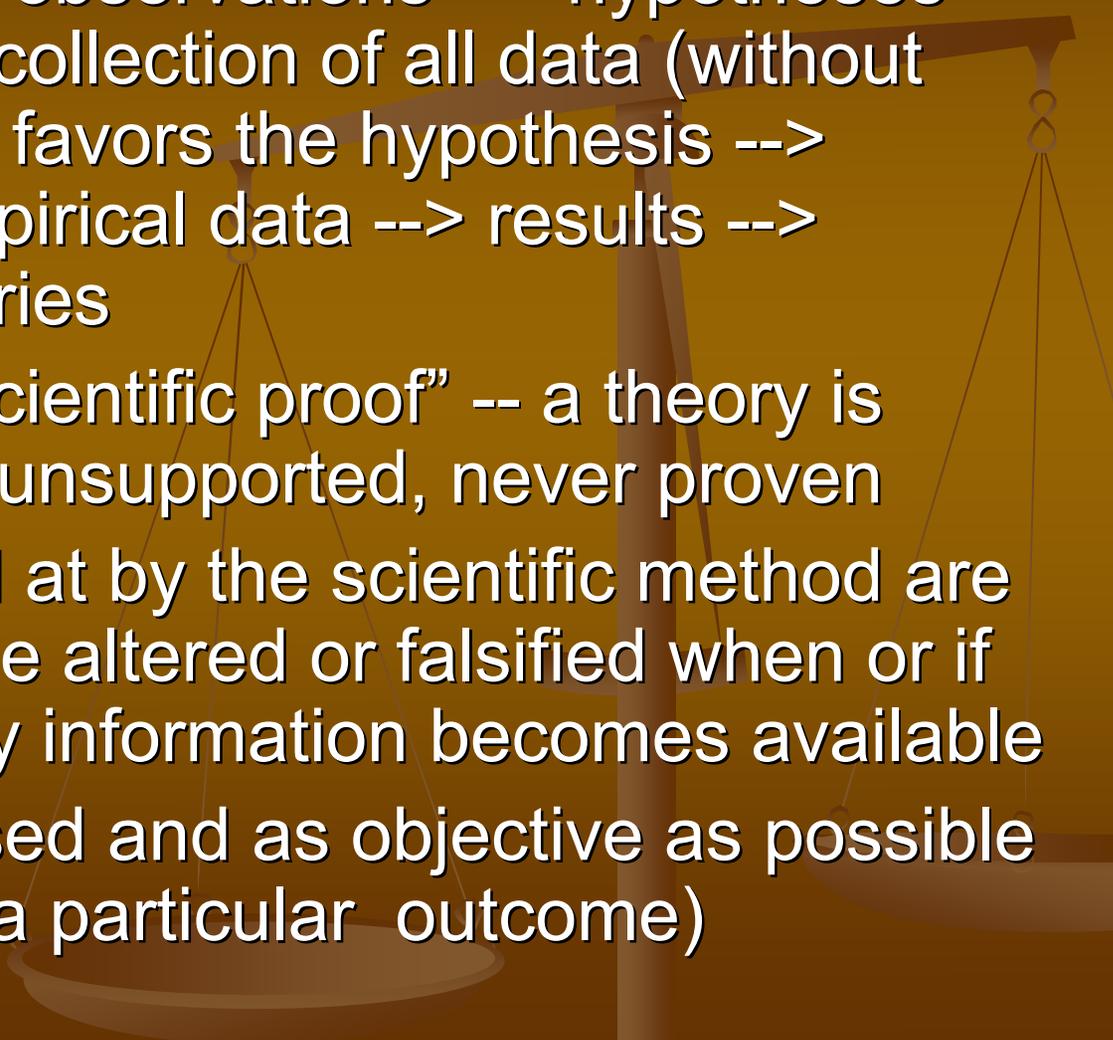
- A good defense attorney will challenge any novel scientific evidence presented in court against his client
- Under *Daubert* scrutiny, some forensic evidence has been challenged in court
 - Fingerprints
 - Error rate is not known
 - Polygraph
 - Reliability
 - Does not have general acceptance of relevant scientific community
 - Bite marks
 - Reliability
 - Dearth of scientific research supporting conclusions

Why do we trust scientific experts?

- Science
- Peer Review
- Standardization
- Accreditation
- Certification



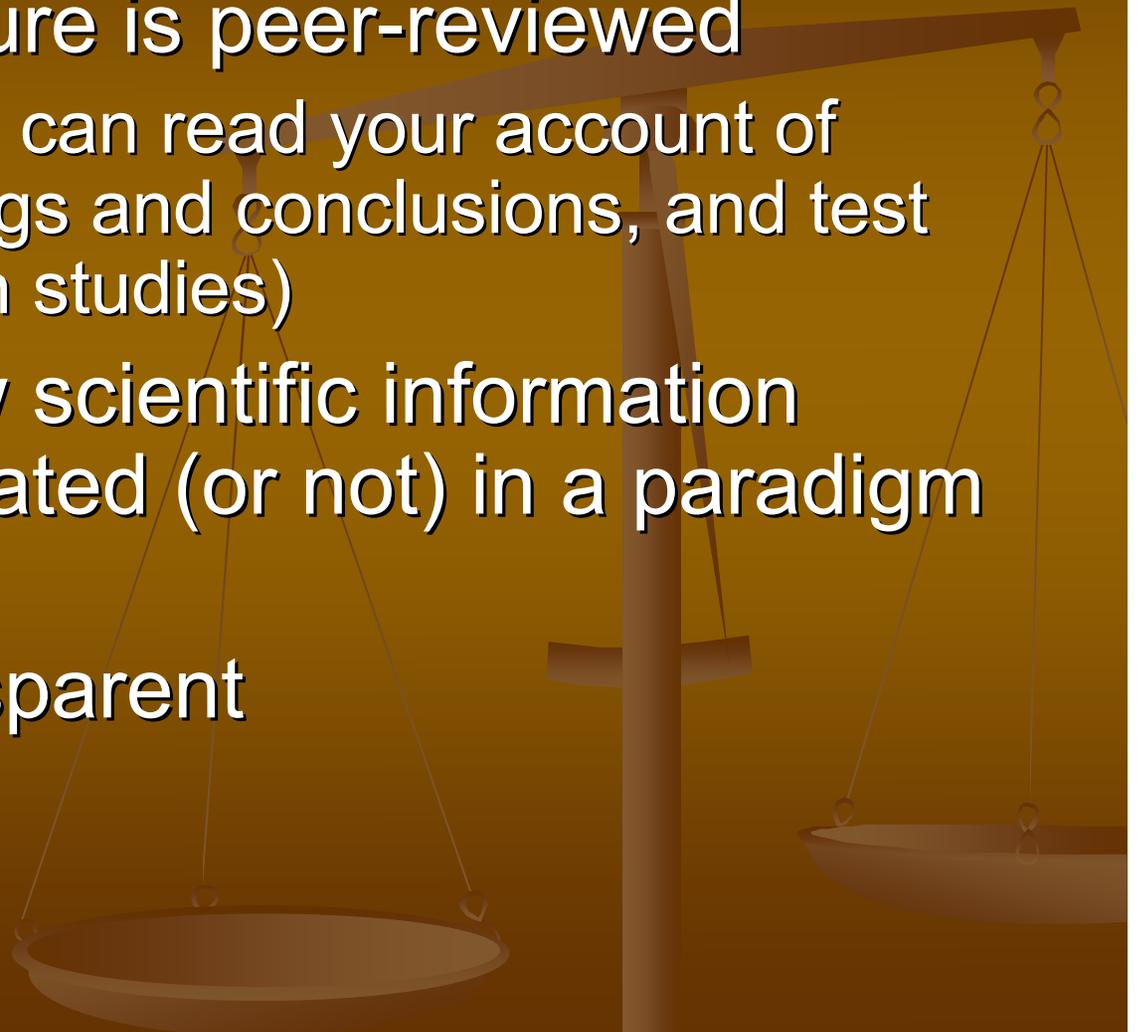
Science



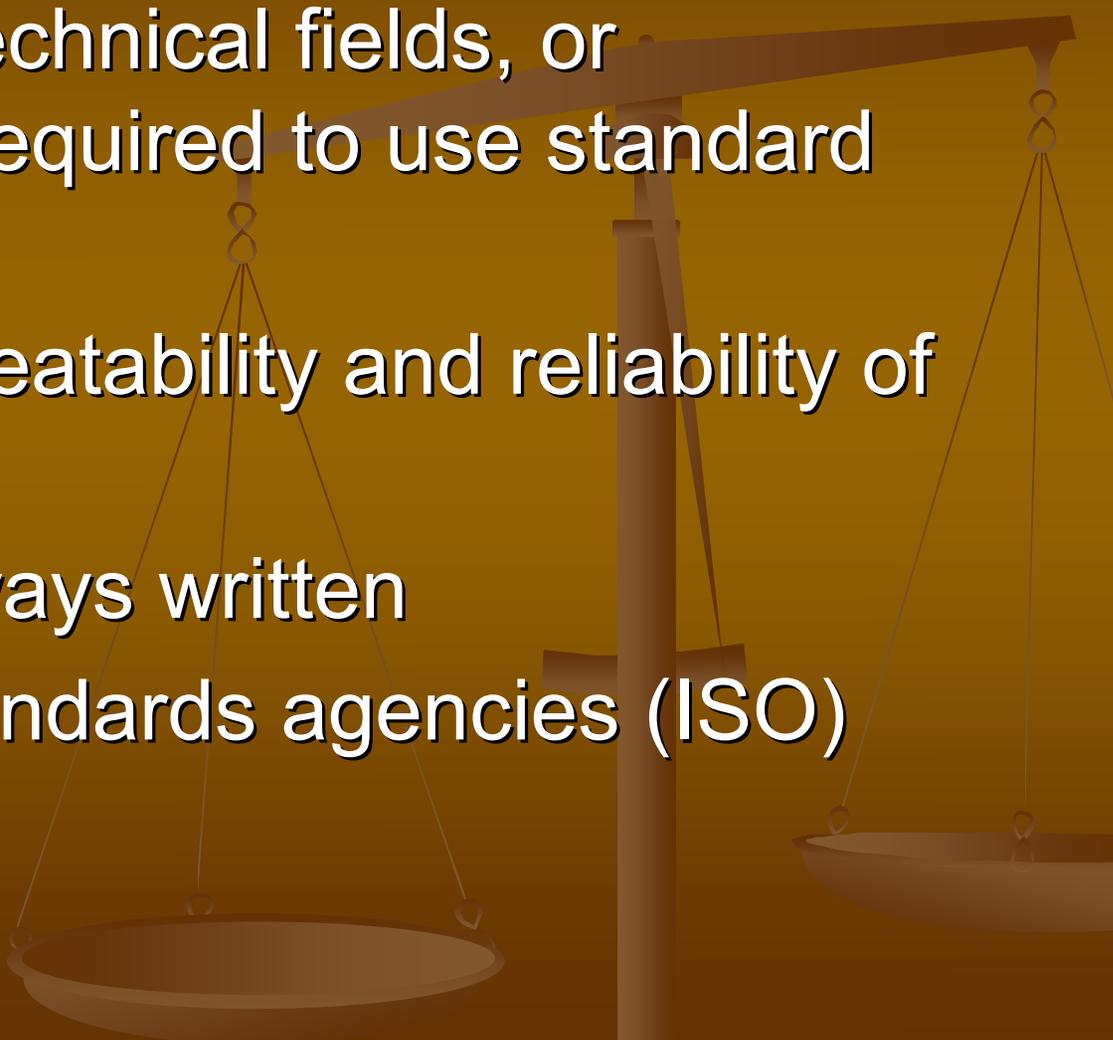
- **Scientific Method:** observations --> hypotheses and predictions --> collection of all data (without regard to whether it favors the hypothesis --> experiments --> empirical data --> results --> conclusions or theories
- No such thing as “scientific proof” -- a theory is either supported or unsupported, never proven
- Conclusions arrived at by the scientific method are not fixed, but may be altered or falsified when or if new or contradictory information becomes available
- A scientist is unbiased and as objective as possible (ie, not attached to a particular outcome)

Peer Review

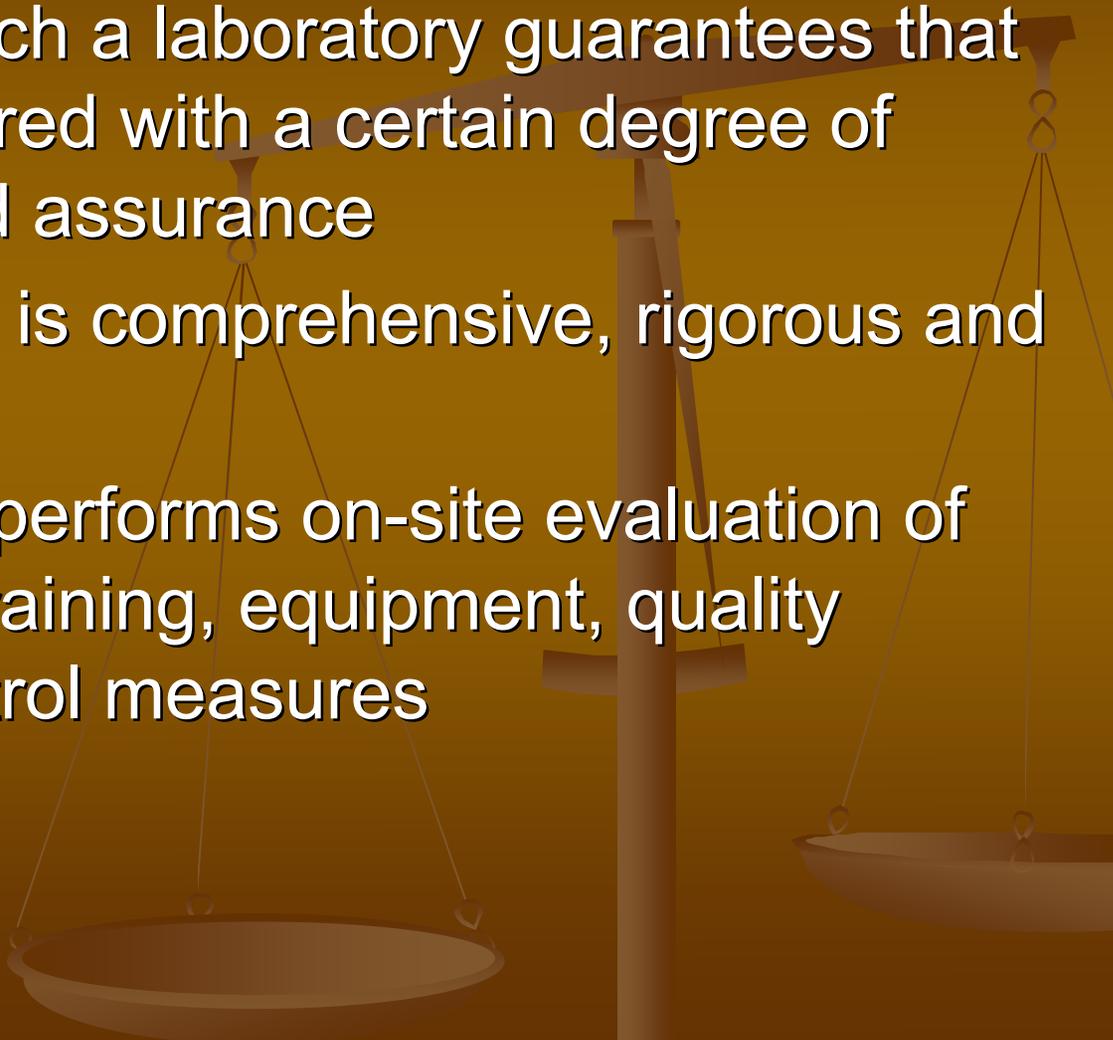
- Scientific literature is peer-reviewed
 - Other scientists can read your account of methods, findings and conclusions, and test them (validation studies)
- This is how new scientific information becomes integrated (or not) in a paradigm or theory
- Science is transparent



Standardization

- Most sciences, technical fields, or professions are required to use standard protocols
 - This ensures repeatability and reliability of results
 - Protocols are always written
 - Adopted from standards agencies (ISO)
- 

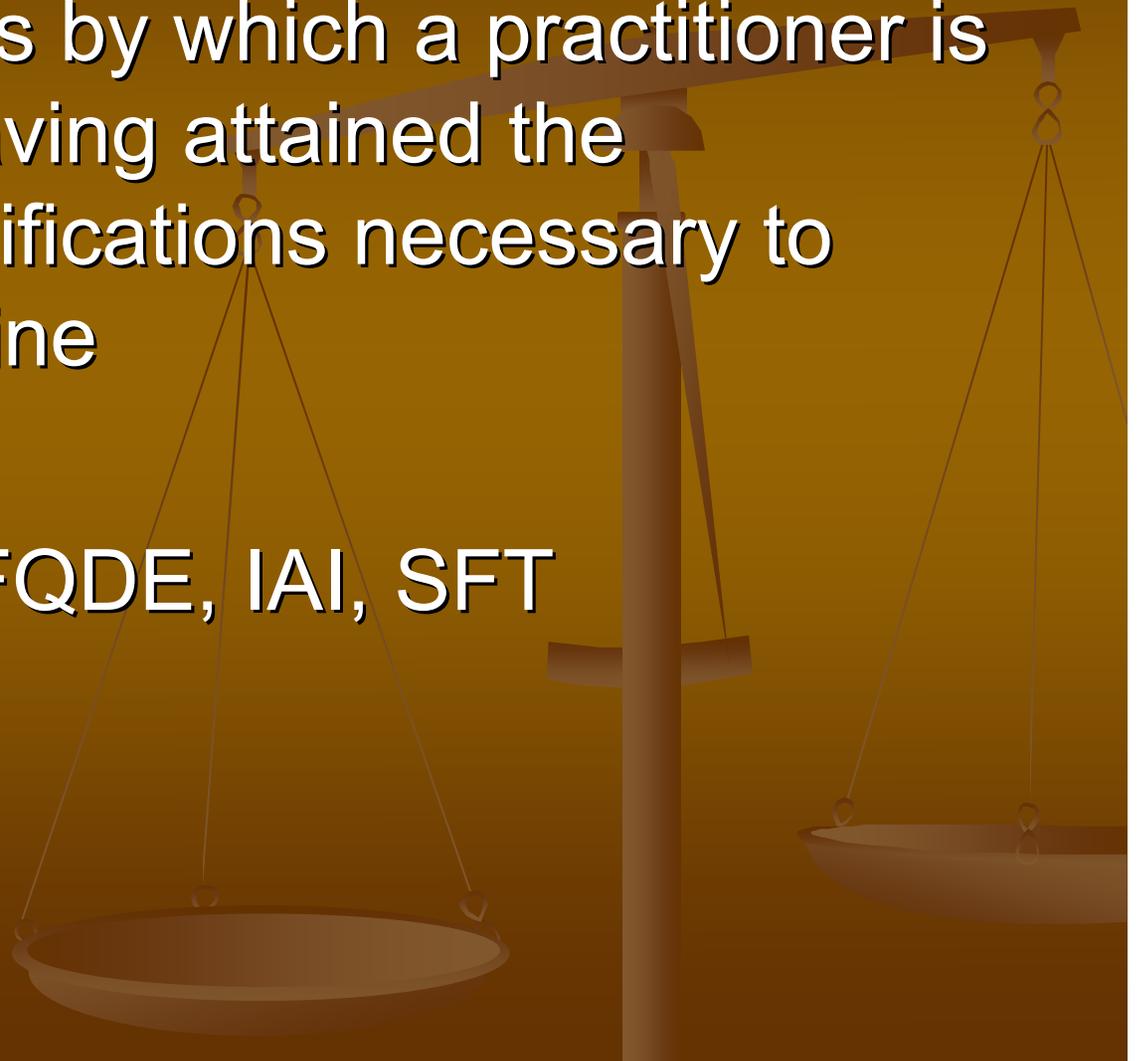
Accreditation



- The process by which a laboratory guarantees that its services are offered with a certain degree of quality, integrity and assurance
- Application process is comprehensive, rigorous and demanding
- Accreditation team performs on-site evaluation of facilities, security, training, equipment, quality assurance and control measures
- ASCLD-LAB

Certification

- Voluntary process by which a practitioner is recognized as having attained the professional qualifications necessary to practice a discipline
- Testing
- ABC, AAFS, ASFQDE, IAI, SFT



But *should* we trust scientific experts?

- Yes
 - Scientific conclusions may be trusted
 - Truth seeking, objective, transparent, open to new information, self-correcting
 - Daubert, FRE 702, Frye help safeguard the reliability of scientific evidence
 - Unethical scientists exist, but unethical *people* may be found in *all professions and occupations*
 - That does not mean we should not trust scientific conclusions
- 