

Scientific Conclusions – Are They Facts?

(A Simplistic Explanation of Scientific Conclusions)

Will the sun come up tomorrow morning? Most likely it will but scientists won't claim this as an absolute truth.

Will it be hot in Arizona tomorrow? Past experience and current data indicates that it will but scientists won't claim this as absolute either. It's possible that a freak snow storm will occur (though highly unlikely).

Will milk spoil over time? Again, all evidence says that it will but scientists never make absolute claims (except with exact sciences).

The likelihood of the sun not coming up tomorrow, a freak snow storm happening in Arizona tomorrow, or milk lasting indefinitely is so remote that we tend to discount the possibility of these events happening. We tend to make scientific conclusions sound like facts when in reality they are not. A scientific conclusion is considered tentative; always left open for refinement, even when it's highly unlikely that the conclusion can ever be improved upon. This is a protocol of science as an effort to continually allow for better conclusions.

In science, conclusions aren't considered facts, firm conclusions are known as laws, theories, principles, inductions, deductions, abductions, etc. They are conclusions that have gone through thorough testing and have sufficient justification behind them to be referred to in a conclusive sense, when perhaps that is a bit of an overstatement. Additional testing may not be needed or desired but science leaves all conclusions open for further testing as a final quality assurance measure. Nobody ever thought that Newton's Law of gravity could be improved upon but after 200 years of acceptance, Einstein did just that, he improved upon something that everyone accepted as being a fact. This shows the value of leaving conclusions as tentative over accepting them as absolutely conclusive.

Permanence (or persistence) and uniqueness of fingerprints fall into the category of scientific theories. These theories are thoroughly researched and have sufficient support behind them to consider them generally accepted. These conclusions aren't facts but they are sometimes incorrectly referred to as such.

What about specific conclusions of identification or exclusion? Do we have a validated method to say conclusions should be generally accepted as well? Does ACE-V result in well justified conclusions? Most of the time this may be true, but not always. Well know errors and problem identifications show that the method alone is not specific enough to always arrive at accurate conclusions. ACE-V is too vague to make a claim of being validated to the point where conclusions can be relied upon simply by using the ACE-V method. The validity (the soundness) of a specific conclusion needs to be based on the specific justification behind each conclusion and shouldn't be assumed for all conclusions.

This brings up the question of what would be considered to be a fact in science. Scientific facts are ideas that have been formally proven or ideas that meet a specific measurement or criteria. Exact sciences, such as arithmetic, geometry, and many ideas of physics offer formal proofs behind them. Even though mathematical formulas may provide fact based conclusions, the application of these formulas may not result in fact based conclusions. The applications of these formulas are considered deductions that are only considered facts once the proof is completed. The existence of an item may be able to be proven if it meets specific requirements. These requirements are usually more than just seeing the item. Simply seeing something doesn't mean it exists, it could be a mirage. Recently scientists found it necessary to redefine the criteria for what constitutes a planet. When the definition became more specific, the planet Pluto no longer lived up to the new definition and is no longer considered to be a planet. Scientists have proof that Pluto exists, it just isn't considered to be a planet.

With the renewed emphasis on forensic scientists not overstating their conclusions, it's important for practitioners to understand the weight of their conclusions. Conclusions aren't absolutely conclusive or considered to be facts, conclusions should be sufficiently tested until the justification is so compelling that others will be satisfied in the conclusion as well.

Some may worry that testifying to conclusions which aren't stated as facts diminishes the weight of those conclusions. Perhaps it does. The weight of each deduction is as weak or as strong as the justification that supports the deduction. A deduction that has strong support may be as solid as the sun coming up tomorrow. Conversely, a deduction with weak support may not have the same weight as it did when indicating it was a fact but this stands to reason and seems 'fair'.