Forensic Scientists differ when defining document examination. Is it a science? If so, which science? What is our scientific analysis? Or, as some people believe, is document examination an art?

Definition of Science:

Science is a way of finding knowledge through well supported justification. It provides the best explanation given observed data.

Merriam Webster – knowledge about or study based on facts learned through experiments and observations.

Free Dictionary – the observation, identification, description, experimental investigation, and theoretical explanation of phenomena.

Wikipedia – is a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions.

Different types of Science:

Pure Sciences

Pure sciences use the experimental method in order to formulate theoretical construct, explicate natural laws, and to expand knowledge.[1]

Exact Sciences

Historically, this expression comes from Aristotle. He used the phrase to describe sciences that demonstrate precise conclusions from known principles; philosophy, arithmetic, geometry, astronomy, and harmonics. Ptolemy argued that philosophy was less precise and was not based from known principles. In the 17th century, the meaning of this expression began to change. Mathematics no longer appeared to be a science, but the language of or an assistant to science. Physics is now regarded as an exact science.

Hard Sciences

Hard sciences are quantifiable sciences. The strict use of scientific protocols is associated with mathematical equations.

Natural or Physical Sciences

Natural and Physical Sciences are harder to accumulate quantifiable conclusions: weather. They include astronomy, psychology, sociology, medical diagnosis, anthropology.

Observational Sciences

Observational Sciences cannot construct experiments to test ideas (how continents shift, how judges react to information). To substitute for experiment, statistical calculations and/or past data can allow for approximations. These sciences include geology, astronomy, and social sciences. Technology allows for observational science to become experimental sciences

(discovering what comets are made of). Conclusions are represented as "The known data indicates..." "The known data infers..." The data does not prove ideas are true.

Applied Sciences

Applied sciences use scientific principles for a practical application. Practicality, time, and financial aspects are considered in applied sciences.

Examples of Various Types of Sciences:

Pure Science	Applied Science
Physics	Engineering
Mathematics	Statistics
Dactylographic	Handwriting Identification
	Medicine

Medicine (applied science) – If you go to the doctor for a cold, they do not do blood tests because it is not financially reasonable under the circumstances.

Any of the sciences can be applied science, even hard sciences. It just means that time and money is a consideration in how much work is performed.

Art

1) A kind of knowledge that is typically considered nonscientific such as the Liberal Arts. Traditionally this kind of knowledge has been considered nonscientific because it lacks one or more of the requirements of a science, such as having testable observations. Examples: Accounting, Economics, and Religion.
2) A skill, talent, or ability that one can possess innately or by study or practice. This definition of art can apply to an individual involved in the liberal arts, the sciences, or any craft, trade or activity. This is not an essential requirement for any occupation or activity but certainly is a benefit.

Document Examination

Document Examination is a natural science (or observational science) and applied science. The natural science means that we rely on analytical thinking, not always experiments. And the applied science means that time and money is considered.

The goal of science is to provide the **most reasonable explanation** through rational explanation. This explanation is considered accurate until observations are seen that contradict the explanation (Newton and Einstein). Except for exact or hard sciences, science does not make claims that are conclusive; they leave the door open for a better conclusion. It is not facts or absolute truths.

One of the scientific methods used in questioned document examination is hypothesis testing. Hypothesis testing has been used for more than 400 years. It is an accepted scientific technique and is most popular due to the reliability of the results when the process is used correctly. It shows others that you have observations to support your theory or conclusion. A nonlinear process is a circular process continually reviewing additional data for an improved or stronger conclusion. Some examiners take a linear approach and do not return to additional information to review for an improved or stronger conclusion.

Hypothesis testing is a rough outline to guide an examiner through an experiment, not a precise methodology. It doesn't guarantee correct conclusions. The last step of the testing is a built in quality control measure to ensure the best possible results. Peer review does not always have to be done, but results must be **open** to a peer review or scrutiny from a qualified document examiner.

Four Forms of Theory Testing:

1) Start with a hypothesis as a possible explanation.
2) Gather all the data to draw correct conclusions, not only data that supports your conclusion.
3) Your conclusion will be valid, testable, repeatable or reproducible, falsifiable, as well as explainable and demonstrable.
4) Peer review insures objectivity and non-bias. It does not ensure accurate results or conclusions. Review should scrutinize all aspects of analysis, not only the conclusion.

1) Have observations or collect data.
2) Form a hypothesis.
3) Use the hypothesis to predict the existence of other phenomena.
4) Experiment and do testing. You may need to collect more data.
5) Form a conclusion.
6) Have your work peer reviewed.

1) Observe data.
2) State a question.
3) Form a hypothesis.
4) Make predictions to test hypothesis.
5) Experiment and test.
6) Draw conclusions.
7) Have your work peer reviewed.

ACE-V is another form of scientific method. Roy Huber formulated this modified version of hypothesis testing in 1959. It is the method used by the FBI, the US Treasury, and the US Postal Service in their questioned document laboratories.

A: Analysis

The first step, analysis, requires the expert to examine and analyze all variables influencing the unknown handwriting in question. The examiner must ensure that there is objective data. The examiner must have a sufficient amount of data for comparison.

C: Comparison

The comparison process introduces the known exemplars with which the questioned handwriting is to be compared. At this point, there is also another analysis phase taking place. Consider all data, not just what supports your conclusion.

E: Evaluation

The result of the comparison is the evaluation process or making a conclusion. In order to reach a reasonable conclusion, the document examiner should have consistent and sufficient data. He/she must have justification behind decisions or conclusions. The conclusion must be able to demonstrate the justification. The justification should be objective data. Don't ignore what doesn't fit. The amount needed is enough to satisfy the general consensus.

V: Verification

Verification is a form of peer review and is part of most sciences. Many examiners erroneously use verification as a method of protecting against errors, in place of adequate training. While verification may prevent the occasional error, its purpose is to verify process and objectivity as opposed to only check results. It is also an excellent vehicle for training. Another way to verify is to falsify. Play the devil's advocate. This will show independence as opposed to being personally attached.

Document examination is a science using hypothesis testing that has been around for 400 years and is the most reliable and most accepted when used properly. We can explain the terminology with confidence that we are using scientific methods and principles. I hope you find this beneficial and helps you in your practice.

[1]*(Feibleman, J.K. 1972 "Pure Science, Applied Science and Technology: An attempt at definitions."*

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