Alan Morris tells *Quest* about the exciting science of forensics

**What is forensic science?**

Forensics is an exciting word. It conjures up police investigations, dead bodies and bullets under microscopes, but it actually isn’t terribly well understood by most people. ‘Forensic’ simply means ‘pertaining to the law’ and comes from the Latin name *forum*, which was the place in ancient Rome where court cases were heard.

Technically, anyone in the legal system, from judges to court orderlies are part of the system, but the reason we associate the word forensics with dead bodies and bullets is because today the term is most often used to describe ‘forensic science’.

Sometimes we use the general term ‘forensic scientist’ to represent all expert scientific witnesses, but this is not technically correct. In my opinion, there is no such thing as a forensic scientist, only a scientist with knowledge of a specific field who gives his or her opinion about that subject in court. There are many scientific specialties that can contribute to the legal debate – psychologists who talk about a criminal’s state of mind, geneticists who can show who was the real father of a baby, entomologists who can tell you about how insects give clues to the time since death, engineers who can tell us why metals break or bridges collapse, chemists who talk about drug purity, toxicologists who tell us about poisons, pathologists who know about causes of death and even zoologists and botanists who talk about poaching plants and animals. There are even a few experts out there who have knowledge in several of these fields and come very close to being undifferentiated forensic scientists.

Each of these authorities has a different expertise, but what they share is an approach to the presentation of their information to the courts. Each authority needs to be able to explain technical issues to non-specialists and also needs to understand legal procedures. In theory these people are neutral, presenting the scientific facts so that the court can make an informed decision, but our legal system, unlike that of the traditional courts, is adversarial and the expert witness may be called by either the prosecution or the defence.

An adversarial legal system is one in which the defence and the prosecution confront each other and use evidence to do so.

This does present potential conflicts. Although the facts are always the facts, a scientific witness called by the defence may concentrate on the unreliability of the date being used in evidence to sow doubt. The same witness, if called by the prosecution, would emphasise his skill of observation in order to boost the reliability of the data. This becomes critical when the case is being built on circumstantial evidence. In fact our
expert is a specialist whose primary job is explaining his or her field of knowledge to the court.

Circumstantial evidence is indirect evidence, for example someone says that the accused was seen near the scene of the crime. This is not as solid as, for example, physical evidence that the accused was actually present at the scene of the crime, such as body fluids or fibres from clothing.

**Changing evidence**

So what do forensic scientists talk about in the witness stand? It is science, of course!

What the court wishes to hear is the scientist's opinion about scientific evidence. Judges and magistrates are not trained to understand scientific data and they need someone who can clearly tell them the meaning of the evidence and how it should influence their decision about the case. If there is more than one scientific expert giving evidence in a trial, which one should the judge believe? It used to be enough for the expert to recount all of his or her skills to impress the court. How many scientific papers have you published? How many higher university degrees have you obtained? In how many court cases have you previously given evidence? But times have been changing and this is no longer always the measure that the judge uses to be convinced that one scientist is better informed than another.

The big change in how scientific evidence is presented in court began in the United States about 20 years ago. A judge was asked to decide whether or not a chemical company was guilty of poisoning the water in such a way that a baby born in the area had birth defects. He listened to expert witnesses for both the family and the chemical company but he was very frustrated because it all seemed to be one opinion after another without real evidence being presented. In the end, the judge issued a guideline for future cases which are now known as the ‘Daubert Standards’, named after the case that triggered them.

The Daubert Standards ask five questions:
1. Has the technique been tested under field conditions (rather than just in a laboratory)?
2. Has the technique been subject to peer review and publication?
3. What is the known or potential rate of error?
4. Do standards exist for application of the technique?
5. Has the technique been generally accepted within the relevant scientific community?

What these questions have in common is that the court is asked to consider the validity of the evidence along with the qualifications of the scientists. Although South African courts are not compelled to use these Daubert guidelines, most forensic scientists are very aware of them.

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Alan Morris is a professor in the Department of Human Biology at the University of Cape Town. He has published extensively on the origins of anatomically modern humans and the Later Stone Age, Iron Age and Historic populations of Malawi, Namibia and South Africa. He has a particular interest in forensic science and recently published Missing and Murdered: A personal adventure in forensic anthropology.