In any death other than by natural causes, the evidence of medical-legal experts are necessary. Medico-legal investigations involve experts in different fields of medicine, law, philosophy and police operations, who have their basic training as doctors, lawyers, natural scientists and police officers. In order to reach a conclusion, which will be helpful in proving the innocence or guilt of a suspect or in measuring the genuineness of an insurance claim they have to acquire some knowledge of each other's way of reasoning. Books are one way of acquiring knowledge but one have to search around the unfamiliar literature to find the material they require. Computers are now accepted as an efficient medium for carrying encoded expertise and making it available through conversation.

Computers are used in forensic medicine as a data storage and retrieval system of autopsy records. Information from any medical unit suffers from the problem of maintaining the records in almost absolute secrecy. This confidentiality is much more important in the practice of forensic medicine. At present in most of the places the vast collective experience of any department of forensic medicine resides in the individual memories or hidden away.
among thousands of illegible hand written or type written records stored in some store rooms. Searching of manual records is labour intensive, hence extremely expensive and prone to human error. By storing the information in a computer confidentiality is maintained by password to access the computer, serial numbers rather than names, places and dates and the data coded in a unique digital code which will not be available to any one other than the authorized persons.

Leeds university computer department had developed a program package for data input called INFORM. The retrieval of information in any desired form were made possible by a complementary program called EXTRACT (Sivaloganathan 1987). Out of the 83 parameters, the first part of 82 parameters contains serial number, age, sex, post-mortem interval, body and ambient temperatures, height, weight of the body and the weight of the principal organs. The final column is reserved for comments. The INFORM program is used to put information into the computer in a manner identical to EXTRACT. The parameters to be filled in are date of input, title of articles, journal and its reference, abstract and its contents, source, name of the collector of the reference, keywords, etc.

2.3 COMPUTERS IN TOXICOLOGY

In toxicology computers are used as a data collector and processor. They collect the data, evaluate and interpret the data. Curry's (1970) information retrieval system consist of a register on human toxicology involving the analytical results in cases of sudden death involving poisons and drugs. MEDLARS - MEDical Literature
Analysis and Retrieval System is developed by national library of medicine in Bethesda, Maryland (Curry 1970 a).

UKCIS - United Kingdom Chemical Information Service computer have over 13000 journals containing chemical abstracts. The emergence of the low cost computers are expected to be a powerful competitors for the interpretation of data. Chromotograms of accelerants paints and plastics are to be scrutinized in precise fashion by pattern recognition algorithms (Saferstein 1983).

Application of expert system shells in forensic toxicology is reported by Spihler (1989). The shells used were EXPERT 4, BEAGLE and KNOWLEDGEMAKER. The data base used was case data from 200 morphine involved deaths. Interpretation was defined as estimating the dose, response and time after drug dosing. The programs were used to advise on time and response outcomes for cases, to calculate the probability of the estimate being true and to develop rules for interpretation of morphine involved cases and to draw a decision tree. These expert system shells are also used to study the dose concentration, time relationships of amitriptyline in overdose (Wimbish et al 1991). The computer models achieved a high degree of success when tried with the data from dogs.

Consultations type programs using artificial intelligence techniques are available for drug usage (Kinney 1986). This system uses 1300 rules about drug interactions, and provide the user with the option of seeking how a conclusion was reached. An expert system building tool EXSYS is used in this program. PHILEX - PHarmaceutical Industry LEXicon, allows the general practitioner to prescribe the most appropriate drug for a
patient's illness, taking into account, factors such as age and other medication being taken.

2.4 COMPUTERS IN LAW ENFORCEMENT AGENCIES

No group of clients was as ready for the special advantage of computers as the police forces. Computers are used in criminal investigation system to store the criminal histories, vehicles stolen and lost properties. Some of the effective programs are:

SEARCH - System for Electronic Analysis and Retrieval of Criminal Histories developed by NCIC - National Crime Information Centre.

CLETS - California Law Enforcement Telecommunication System, permits any urban or rural police agency to get at electronic speed data on wanted persons, vehicles stolen, lost property and wanted or stolen firearms.

MICA - Major Incidents Computer Application developed for the Britain's west Yorkshire police force, can be used to handle many different incidents at the same time and in the case of two police forces operating the system, one can search the other's statements for commonality clues with the aid of an entry password.

NOMIS - is a computerized information and communications system for a state wide medico-legal investigation system (Fullilove et al 1978).

CJPI - Criminal Justice Periodical Index is a bibliographic reference base consisting of the names of the journals, magazines, and other publications about law, law
enforcement, and the criminal justice system in the United States.

CJAD -Criminal Justice Archive Directory contains references to information on crime and the criminal justice system from the computer files of an international network of more than 250 universities. The information in the files include data relating to the number of crimes of a particular type committed, type of crimes committed by juvenile offenders and the number of inmates in a prison.

HOLMES -Home Office Large Major Enquiry System is used for conducting a series of aptitude tests designed for the selection of staff to work in offices with high degree of automation. The ability tests of the system are also used as a screening device, where the data were used to rank the candidates (Rodie 1989, Barrington et al 1985).

GREAT -Gang Reporting Evaluation and Tracking system is used to check gang related information such as members of the gang, gang tactics and speciality if any (Ruester 1989).

CARES -Computer Assisted Recovery Enhancement System is assisting the portrait artist in producing a portrait. Using the system a portrait artist can age the picture of young people who have been missing for several years. This system can alter faces, change their direction, enhance poor video tapes and photographs and remove or add facial hair, glasses or other forms of disguises (Clark 1989).

CRISIS -is a computer program written purposely for major disasters. The system suggests matches and lists
evidence for the human experts to agree or disagree. It has the capability to vary the parameters for comparison to suit the circumstances of the disasters (Rand 1989).

Computer programs based on engineering principles uses the information obtained in a field investigation of a automobile accident involving two or more cars and the police report as input and simulates and reconstruct a sequence of events that must have been taken place resulting in the accident (Chi et al 1985, Badger 1989).

At present, computers are also used for incorporating and assessing evidence obtained in the course of a criminal investigation (Aitken et al 1989), to extract the unique characteristics and to improve poor quality finger prints, as a learning system in small agencies which cannot afford to develop specialists in various skills (Lesec 1989), to plot the locations of death (Hanzlick 1987), and as a supporting system to assist investigating officers to sketch the crime scene (Arndt 1986).

2.5 EVIDENCE BY COMPUTERS

When experts are to be judged by non experts, the judgement has to be based on evidence. When giving evidence contrast to a witness, the forensic expert not only has to report his observations but is required to draw conclusions from his findings. The experts can withhold knowledge of the objective results from the non experts, who are to judge these results, and place people in a very difficult and trouble some situation (Berkely 1984).
An expert in any field of knowledge must have a potential for change, otherwise they may become obsolete. It is often very hard in a rapidly expanding field to stay as an expert, because once a man becomes an expert, he is promoted out of the area in which he must stay working if he is to remain an expert. From an employers point of view a human expert has other drawbacks. He can get sick, or die or be bought off by a competitor. Older well known and possibly famous experts, when spoiled by success and flattery can tempt to take forensic problems which are outside of his training and experience. Some times due to fatigue and other emotional feelings the opinion of the human expert may differ. The language used by the forensic expert should be readily understandable, otherwise the findings of the greatest forensic expert in the field will be of no value to any one in the court room (Umashankar 1984, Thesiger 1975). Some times a few experts who does not have the expertise may appear as the expert a number of times and the court have no way of ascertaining that the person is an expert (Caddy 1985). Due to this and due to the practices adopted by some corrupt and biased experts the verifying authorities are not interested in the expert's opinion and themselves assume the role of the expert which may complicate the problem.

Unlike the other sciences, forensic science is peculiar that it reaches its point of impact only through the intervention of members of another profession - Lawyers. To get an intelligent answer one must ask an intelligent question (Monenssens et al 1973). Since the lawyers have to search around unfamiliar literature of science to find the material they require, some times the expertise of human expert is not utilized properly in a court [Brownlie 1978]. Further the forensic scientist and
his testimony are going to be evaluated by a group of people who have no scientific background. In a relatively short time the juries are expected to evaluate the expert and his testimony. Humans are not computers and researchers have established that many extra evidential factors may affect juries' decisions (Tanton 1979, McCarthy 1974). Due to the lack of knowledge on forensic science evidence, the courts are not in a position to eliminate the non-qualified expert, because they lack the necessary expertise to determine who is really a qualified expert and who is not (Keefe 1979).

Crime does not wait for the forensic scientist to catch up, so today's criminologist has to have some expertise in areas never before anticipated such as computer crime with the rise of computer science. So a new type of expertise is required from the document examiner (Kates et al 1981). When the judicial system directs that the judge must decide the capability of the expert, the practicing judges are usually concerned whether the so-called expert has previously testified as an expert in his field of knowledge (Hilton Ordway 1972). When an expert witness is morally bound to do his best for his side, it may affect his overall attitude and approach to the case (Ferris 1973). Sometimes procedures and technical knowledge frequently advance beyond the capabilities of certain laboratories but the justice system makes no allowance for these deficiencies (Thomson 1974).

Expert evidence does not depend upon a chance coincidence of time and place, but upon possession of a particular expertise keeps them at constant risk. Whereas the corrupt expert is willing to offer his services for the evidence, genuine experts coming from research laboratories
might not want to testify for all those who seek his services for want of time. In the light of recent cases the media have portrayed the forensic scientists as incompetents (Caddy 1986, Keith Mant 1986).

Julius Grant (1970) suggested that by relieving the Forensic expert from giving evidence by employing a professional evidence giver, forensic scientist will do the actual scientific work. It is often felt that the question and answer method of extracting evidence is unsuited to expert testimony. In United States much evidence is now given in written form as a result of the civil evidence act 1972. In United Kingdom due to the criminal justice act of 1967 which permits the use of written statements instead of oral testimony, the number of court appearances by expert witnesses has declined dramatically. For example in 1967 there were 7973 cases and 2336 court appearances where as in 1972 with 36814 cases there were only 723 appearances (Williams 1973). Civil evidence act caters the admissibility of computer records (Collin Tapper 1983, McNiff 1981). The supreme court of the United States upheld the admission of the computer print out as evidence on the basis of the following reasons: The electronic computing equipment was recognized as standard equipment and the sources of information and the time and method of preparation were such as to indicate its trust worthiness (Lucas 1987).

2.6 ADVANTAGES

If the law can permit the expertise of an expert system for evidence, depending upon the worthiness of the knowledge base of the system the following are the points to be considered in its favour:
[1] The expert system will work consistently all the twenty four hours a day without bias.


[4] Memory is permanent and large compared to the used human memory, which is temporary and limited.

[5] Attorneys and experts can have pre-trial conference with the system, to avoid embarrassing moments at the time of trial.

[6] Judicial officers can get a training in various aspects of forensic science to determine the worth of evidence by the knowledge systems to follow and identify genuine experts.

[7] By having expert system in different fields of forensic science it is easy to educate all the personnel in the forensic laboratory, to the workings of the entire facility.

[8] Forensic scientist can save time and can do actual scientific work.

[9] The experts are free from risk.

Taking the above points in to consideration the problem selected for the expert system applications on Forensic Science has been extended for expert's evidence.

Since the knowledge base of an expert system is flexible in integrating new knowledge incrementally into its existing store of knowledge and the system is able to reason with judgemental or in exact knowledge about the nature of a task or to do the task efficiently expert systems are more suitable to the development of forensic science.
Computers are used by forensic scientists in their analytical laboratories and in other applications for many years. But there is not much interaction between forensic expert and knowledge engineers.

Computers in toxicology laboratories were either attached to specific instruments or were used to tabulate data and perform statistical analysis (Brass et al 1982, Kazyak 1974, McLafferty et al 1979).

2.7 A.I APPLICATIONS IN FORENSIC SCIENCE

Even though the application and usage of computers in these agencies are vast, the application of expert systems in this domain is very little (Hernandez 1986, Cameron 1988, Reboussin et al 1989). Most of the expert systems used by the law enforcement agencies have been built from a commercially available expert systems shell like EXPERT -4.

AREST -Armed Robbery Eidetic Suspect Typing expert system uses a knowledge base and "If-Then" inferences for suspect identification in armed robbery incidents (Badiru et al 1988). A few works has been reported regarding the use of computers in forensic judgement and evidence (Dumser et al 1990, Stassburger et al 1990).

An information retrieval system for firearm open bullet file search is available which can give the information about the agency which has supplied the bullet obtained from the firearm in question. The input to the system is number of glands and grooves, twist, land width and groove width (Oakes et al 1979).
Computers are also used in other fields of forensic science such as forensic odontology, forensic anthropology and criminal investigations (Cheevera 1987, Dykes et al 1987, Hazard et al 1987, Masatsugu et al 1985, Westlund et al 1987).