DOWNLOAD PDF BRIEF HISTORY OF FORENSIC DNA

Chapter 1 : Evolution of forensic odontology: An overview

A Brief History of Forensic Investigation A Brief History of Forensic Investigation Despite common misconceptions, forensic investigation has been practiced, in one form or another, for thousands of years.

Aravindha Babu , Sudha Jimson , C. Priyadharsini , and K. This article has been cited by other articles in PMC. It refers to the proper handling, examination, identification and evaluation of dental evidence. This article summarizes the evolution of forensic odontology that started right from Garden of Eden to the modern scenario in identification of the gang rape case which happened in the state capital. Forensic dentistry plays a significant role in identifying the victims of crime, deceased individuals through the examination of anatomical structures, dental appliances and dental restorations. Bite mark, forensic odontology, victim Forensic odontology or forensic dentistry is the application of dental knowledge to those criminal and civil laws that are enforced by police agencies in the criminal justice system. We human beings are separated from other animals by a number of essential characteristics and have certain uniqueness. One of the unique characteristics of human morphology is the human dentition that withstands the test of time and temperature. Treatment given by a dentist is the biggest contribution to the uniqueness of an individual dentition and is the key in the identification of the oral cavity. Teeth are the most indestructible part of the human body. They survive not only after death but remain unchanged for many thousands of years. A well-known example is the teeth found in the mandible of Tabun man for aged about 35, years old. Secondly, with a view of the examination of marks to possible identification or subsequent elimination of a suspect as the predator. Thirdly, examination of fragments or complete dental remains including all types of dental restoration to a possible identification of the latter. So in simplest terms there are two aims in forensic dentistry. Simple one is the identification of the dead and complex one is the identification of an assailant who has used his or her teeth as weapon. Historical Background The evolution of forensic odontology started right back in the Garden of Eden. According to the Old Testament, Eve convinced Adam to put a bite mark in apple. There is no record of events, comparisons or analysis, and it is in addition there were a limited number of suspects and the suspects reportedly confessed. But well-documented evidence to the use of teeth for identification began during 66 AD with Agrippina and Lollia Pauline case. Agrippina after her marriage with Claudius, emperor of Rome, Agrippina tries to secure her position. She feared about rich divorcee Lollia Paulina may still be a rival for her husband. She decided that it would be safer if Lollia Paulina was dead. She instructed her soldier to kill Lollia Paulina and further instructed to bring the head back. She was satisfied by Lollia Paulina death by the identification of dental alignments and certain distinctive characteristics. It was the first use of dental identification where there is a record. Joseph Waren was killed in the year His face was not able to identify as he suffered from a fatal head wound. A dentist, Paul Revere, identified Dr. Warren, dead body by a small denture that he had fabricated for him. The identification made by Paul Revere made it possible to burry Dr. Warren on April 8th, with a full military honor. Janet Mc Alister in Scotland. A lecturer of anatomy Dr. Granville Sheep Pattison and two of his students was charged at the high court in Edinburgh for the violation of Mrs. They have moved the body of Mrs. Alister after the burial to the nearby college. It was found by dental evidence in the form of the maxillary denture that was found in the heads in the dissecting room. He tested that a set of her denture fit in only one of the head in the dissection room. In the trial, it was pointed that Caroline Walsh had perfect teeth. But this Caroline Walsh had lost her front teeth many years ago. Walsh was never found, and the accused was convicted. A plan was made to erect a monument to the young prince. But many rumors were generated regarding the prince that he was still alive, and another child was buried in his place. The story continued in , in the reconstruction of a church. The skeletal of a child containing a lead coffin was found near the side entrance. Milicent examined the bone of the body and concluded that he had died of bad breath and neglect. Examination of the bones by Dr. Recamier said that they were those of an individual, of aged 15 or 16 years. The age assessment made by Dr. A skeletal of a young male was found containing a coffin. As a base of the tooth development, three experts aged the skeleton at between 16 plus and 18 plus years. Finally, it was concluded the remains was not Dauphin. It is documented as the first cases of

forensic dental age estimation. George Parkman in the period of 18th century, in addition he was also an real estate speculator and money lender who failed to return from dinner on November 23rd A suspicion was made on John White Webster as it was known that he owed some amount of money from Dr. When his laboratory was searched, remains of the human body were found. Nathen Cooley Keep identified Dr. Parkman body, by his teeth as a part of upper and lower denture which he was made for Dr. Parkman 3 years earlier. Keep showed the court, and he fitted the portions of the lower denture to the models and also showed that grinding adjustment of the lower denture that he had made for Dr. Webster was found guilty and hanged over. This was the first case of a dentist in giving an expert testimony in courts of United States. His tomb was erected in Those who are presented stated that bones and teeth are in very good condition, as if the king William I had died only yesterday, instead of years ago. So the forensic dentist made the identification on the basis of durability and longetively of teeth even though the bodies are severely damaged or long buried. Robinson was murdered, and the suspicion was made on Mr. Robinson of murdering his mistress. A comparison was made on the basis of bite marks. Robinson had five maxillary teeth and the suspect was identified but was not found guilty. The body was identified as Winfield S. Gross tentatively by Mrs. Gross and ten witnesses. The insurance company refused to pay Mrs. A forensic dentist was needed in time. It was stated by Mrs. Gross had never complained of pain or decayed tooth in his lifetime and there were no artificial teeth to her knowledge. He had never had a visit to a dentist in her lifetime. The body was found in the ashes was examined at Baltimore college of dental surgery. A detailed description was given by Dr. Gorgas of the jaws and the remaining teeth. It was stated that there was no misalignment in the lower jaw, and there were two teeth in the upper jaw. Variance was observed between Mrs. Gross and the forensic dentist. It was proven that the remains do not belong to Mrs. The body of the murdered man was found in Pennsylvania. Udderzook, who was the brother in law for Mrs. Gross, and was seen travelling with an unnamed friend to Pennsylvania. The victim was identified, and all the other characteristics were very similar to Mr. So Finally Udderzook was charged and prosecuted in The fate of Mrs. Gross was not known. John Wilkes Booth shot the president and escaped to Virginia. The US Calvary surrounded the barn and set in on fire. Booth was shot dead at the spot. But after many years, the rumors spread that Booth was escaped and was still alive. So the body was disinterred and examined again in The family dentist identified Booth body by the peculiar formation of the jaw that has been noted in the dental records made by the dentist during a dental visit for restoration of a filling.

Chapter 2 : Forensic science Timeline

DNA Use in Forensic Cases â€¢ Most are rape cases (>2 out of 3) â€¢ Looking for match between evidence and suspect â€¢ Must compare victim's DNA profile.

This would allow them to state: Thus, Leuchter is refuted. If we examine the analyses results of samples taken by different people, and obtained with different methods of analysis, it is evident that Markiewicz and his co-workers fudged their results by adjusting their method to deliver what they wanted. Suppressing Unwanted Results In , a document leaked out of the Jan Sehn Institute in Krakow into the hands of the revisionists, and was eventually published in their periodicals. Markiewicz and his co-workers had prepared a first report as early as This report was never published. Its results were discomfiting: On the other hand, samples taken from a delousing chamber showed values up to 20 times higher 0. Hence, in their paper, the Krakow investigators suppressed any information about their initial results. Normally, researchers guilty of such unethical conduct are expelled from the scientific community. Today, most revisionists are aware of the findings revealed in , but not of the later ones published in that seem to refute Leuchter. Not Scientific Truth, but a Political Agenda In a subsequent correspondence with the Krakow researchers, I asked for a scientific explanation of their method of analysis. I gave them irrefutable proof that Prussian blue can be formed in walls exposed to hydrogen cyanide gas, citing a recent case documented in expert literature. In other words, their purpose was not the search for truth, but to serve a political end. Conclusions To summarize the extremely unscientific and politically biased approach of Markiewicz and his co-workers: The Krakow team did just the opposite: These choices allowed them to employ methods that would produce the results desired. Finally, they admitted that the purpose of their research was not to seek truth, but to contribute to the continued disrepute of the long defunct Adolf Hitler. Therefore, I publicly called, and continue to call, these researchers scientific frauds. There is only one place for their research findings: Neither Markiewicz nor his co-workers have ever responded to my accusations. Markiewicz, who was an expert in technical testing, not a chemist, died in ; the remaining two authors have continued to remain silent. Initially I was interested only in finding out whether the resulting compound -- iron blue or Prussian blue -- is stable enough to survive forty-five years of exposure to harsh environmental conditions. After this was confirmed, I mailed the results to some twenty people I thought might be interested in these results. Subsequently I got in contact with several engineers and lawyers, the former willing to help me in doing forensic research, and the latter primarily interested in using the results for their clients. I made two trips to Auschwitz and did eighteen months of further research until, in January , the first, page long version of the so-called Rudolf Report was distributed to opinion leaders in Germany. My report was subsequently updated and enhanced, and finally published in July as a page paperback booklet. A short page summary published in summer is often mistakenly assumed to be a full version of my report. An updated and enhanced version is currently in preparation; publication is planned for later this year. Scientific discussion of my report began with a German book, consisting mainly of unfounded attacks, in He has made some far-reaching concessions in his critique: In order to kill humans as quickly as attested to by the witnesses, hydrogen cyanide in concentrations similar to those used for delousing procedures is required. Leuchter was frequently attacked by his opponents on the basis that much less poison would have been required to kill humans than to kill lice. Although this is generally true, it does not apply to a scenario in which many hundreds of humans are supposed to have died from this poison within a few minutes. Iron blue Prussian blue can indeed be the result of exposing walls to hydrogen cyanide, and, when found in the delousing facilities in Auschwitz and elsewhere, HCN is most likely the cause. The latter concession obviously destroys the reputation of the Krakow researchers and their supporters , who summarily declared that the vast amount of iron blue in the walls of delousing facilities must have a different origin, which in turn "allowed" them to exclude it from analysis. Green, however, is undisturbed by this, and still claims that their results ought to be taken as standard by everybody. To my question of why the Krakow investigators had not responded to my inquiries as to their obviously unscientific behavior, Green responded as follows: Rudolf complains that Markiewicz et al. Why should they do so? What credibility does Rudolf have, that demands

they answer his every objection no matter how ill-founded? Other Forensic Approaches Chemistry is obviously not the only science to be consulted when it comes to solving the mysteries of Auschwitz. Engineers, architects, physicians, geologists, and other experts can contribute to this, too. Nor does their work stop with trying to decipher the hidden messages of material traces on site. Original wartime documents on the facilities and events in Auschwitz require the expertise of engineers, architects, physicians, and geologists as well. When it comes to reconstructing the infrastructure of the camp, down to the function and purpose of every building and every room, the technical modes of operation and capacities of its installations, the extent and modernity of the treatment in its hospitals, the effect of the water table of the swamps, most of which can be determined by analyzing the tens of thousands of documents that have been found or released during the last decade, the historian alone simply cannot do the job, nor can I as a chemist. Ditlieb Felderer was the first to deal intensively with the question of whether or not there were holes in the roof of the alleged homicidal "gas chambers," although he seems not to have published anything about it. Leuchter touched on this topic only superficially in his report. It was this question, rather than whether or not there were still any chemical residues of the poison gas allegedly used, which made me most curious to go to Auschwitz, to search for these holes by myself. On August 16, , while standing on the collapsed roof of the alleged "gas chamber" of crematorium II in Birkenau, I lost my faith in the "Holocaust," because I could find no holes that deserved the name. This I described in detail in my report. In , Robert Faurisson made the famous quip that subtitles this section. Charles Provan has since written an Internet article in which he claims to have refuted this revisionist finding. He did, indeed, find holes in the roof of the morgue of crematorium II. Or are they merely results of the collapsing roof being pierced by the concrete supporting pillars? I am convinced that the latter is the case. What matters are facts. But how are we to establish facts in such a case? According to Robert Van Pelt: In the twenty-five hundred square feet of this one room more people lost their lives than in any other place on this planet. Five hundred thousand people were killed. If you would draw a map of human suffering, if you create a geography of atrocities, this would be the absolute centre. We all know what happens after an airplane crash: The purpose is to determine the cause of the accident in order to prevent it from happening again. No expense is spared. To assemble a staff of hundreds of historians, engineers, architects, and archaeologists to exactingly retrieve all the debris of these rooms and to reassemble them, like piecing together a huge puzzle, in order to determine what they really looked like fifty-five years ago? Would it not be logical to attempt to determine what vestiges we have to expect when looking for holes, before ecstatically jumping to conclusions at the mere sight of a crack in the concrete? During the last few years, I have heard, to my horror, of people walking up to these rooms and breaking off reinforcement bars protruding from cracks or holes, [see note] or taking shovels and clearing the roof of debris in order to look for holes. Sometimes one has cause to wonder: Where have all the homo sapiens gone? When will people begin to think and act about the Holocaust like wise human beings? The question of whether or not there were holes in the roof of crematorium II is not a trivial one. If there were none, then it would have been impossible to introduce Zyklon B into the alleged "gas chamber" in the manner claimed by the witnesses -- discrediting all those witnesses. Because eyewitness accounts are the sole pillar on which the Holocaust rests, this would sooner or later lead to the collapse of the entire Holocaust story. This, in turn, is no trivial matter. The international order established by the victorious powers after the Second World War rests mainly on the "given" of the Holocaust. The Holocaust is used to control Germany and hence Europe , to suppress national movements, and to maintain American dominance -- to say nothing of the power leftist and internationalist movements derive from it, and the use to which Jewish and Zionist groups put it. Who, then, wants to know the truth? Considering our limited means and the legal restrictions placed on us, it might be only realistic to conclude that nobody ever will. Thus all we can do right now is to meticulously map and document the material remains as they are today, from top to bottom, and hope that eventually reason will prevail. The discovery in German wartime documents of ambivalent words for which a sinister meaning can be interpreted is quite common in mainstream historiography on the Holocaust. Jean-Claude Pressac is not the first to have done so, but he is perhaps the most determined, taking it well beyond the bizarre. That approach, applied to a great number of documents on Auschwitz, has yielded another, even more important result that sheds revealing light on the history of the Auschwitz camp system. Samuel

Crowell has unearthed material on air raid shelters built by the SS to protect inmates from Allied air raids. Hans Lamker and Hans Nowak have shown in detail how the SS installed modern and highly expensive microwave delousing facilities to protect the lives of inmates. Together with the fact that the overall costs of erecting this camp complex were on the order of magnitude of some five hundred million dollars, these facilities clearly contradict an intention by the German authorities to use this camp as an extermination center. There are cheaper ways of killing humans than to spend dollars per capita. They seem never to have noticed that they had found it at the beginning of their search: So it can be expected that forensic research about Auschwitz will never cease, especially if one considers the controversial and highly ideological implications of any potential findings. The direction and methods of research, however, are clearly being set by the pioneers in this field, the revisionists, who lack neither the imagination nor the curiosity to discover whether the mass gassing claims of the Holocaust are true, whatever their use for political or financial purposes. The Auschwitz camp system will, as before, be at the very focus of it all. To name one recent instance, in early the Australian engineer Richard Krege employed ground penetrating radar in order to locate or not to locate mass graves in the vicinity of alleged German extermination camps. A preliminary study was published in my German language revisionist quarterly in early No doubt he will not be the last pioneer to challenge reigning dogmas and taboos. Conclusions As they do for all alleged crimes in the historical past, the forensic sciences hold the key to the riddles of Auschwitz. No group with the power to conduct, or else to demand, forensic research on the necessary scale seems willing to do so: Those in power have no stake in changing our view of Auschwitz, and consequently of the Holocaust, and forensic research is liable to do exactly that. Instead, authorities the world over persecute and prosecute those who advocate or attempt such research. This may slow us down, but it will not stop us.

Chapter 3 : Secrets of Forensic Science--Brief History of Forensic Science

Forensic testing can determine if distinctive patterns in the genetic material found at a crime scene matches the DNA in a potential perpetrator with better than 99% accuracy. In , Florida rapist Tommie Lee Andrews became the first person in the U.S. to be convicted as a result of DNA evidence; he was sentenced to 22 years behind bars.

The history of forensic science dates back thousands of years. Fingerprinting was one of its first applications. The ancient Chinese used fingerprints to identify business documents. In , a eugenicist an adherent of the often prejudiced system of scientific classification named Sir Francis Galton established the first system for classifying fingerprints. Sir Edward Henry, commissioner of the Metropolitan Police of London, developed his own system in based on the direction, flow, pattern and other characteristics in fingerprints. The Henry Classification System became the standard for criminal fingerprinting techniques worldwide. Bullet examination became more precise in the s, when American physician Calvin Goddard created the comparison microscope to help determine which bullets came from which shell casings. And in the s, a team of scientists at the Aerospace Corporation in California developed a method for detecting gunshot residue using scanning electron microscopes. Forensic Lab Safety The job of a forensic scientist involves using a variety of chemicals, which can be flammable, corrosive and even explosive if not handled properly. Here are a few tips that forensic labs follow to ensure that their employees stay safe: Labs should have procedures in place for the use and disposal of chemicals, as well as a safety plan in case of emergency including a safety shower and eyewash station. Employees need to be well-trained in the use of all chemicals, understanding the properties of each chemical and its potential to cause injury. Lab technicians should wear the proper gear -- eyewear to protect against chemical splashes and gloves to protect their hands. Chemical containers should be properly labeled with the correct chemical name. Flammable liquids should always be kept in special storage containers or a storage room. Putting these types of chemicals in a regular refrigerator can lead to an explosion. In , a Scottish chemist named James Marsh developed a chemical test to detect arsenic, which was used during a murder trial. Nearly a century later, in , scientist Karl Landsteiner won the Nobel Prize for classifying human blood into its various groups. His work paved the way for the future use of blood in criminal investigations. Other tests were developed in the mids to analyze saliva, semen and other body fluids as well as to make blood tests more precise. With all of the new forensics techniques emerging in the early 20th century, law enforcement discovered that it needed a specialized team to analyze evidence found at crime scenes. To that end, Edmond Locard, a professor at the University of Lyons, set up the first police crime laboratory in France in For his pioneering work in forensic criminology, Locard became known as "the Sherlock Holmes of France. By the close of the 20th century, forensic scientists had a wealth of high-tech tools at their disposal for analyzing evidence from polymerase chain reaction PCR for DNA analysis, to digital fingerprinting techniques with computer search capabilities.

Chapter 4 : A Brief History of DNA Testing - TIME

Funding was provided to establish new DNA testing facilities.A brief history of forensic DnA analysis in new Zealand In British calendrierdelascience.com It was these types of investigations that provided the impetus for the establishment of the NZ National DNA Databank.

Forensic Science History The Early Years Without question, the field of forensic science has come a very long way since its recorded beginnings in the s, when the Chinese used fingerprints to establish the identity of documents and clay sculptures. This field is one of the few areas of law enforcement where science, technology and crime-solving meet. This combination supports the Theory of Transfer: In , a book, Hsi DuanYu the Washing Away of Wrongs published by the Chinese, described how to distinguish drowning from strangulation. It was the first recorded application of medical knowledge to the solution of crime. In , the first treatise on systematic document examination was published in France. Then in , one of the first documented uses of physical matching saw an Englishman convicted of murder based on the torn edge of a wad of newspaper in a pistol that matched a piece remaining in his pocket. The s In the s the field of forensic science saw substantial progress. The first recorded use of questioned document analysis. The development of tests for the presence of blood in a forensic context. A bullet comparison used to catch a murderer. The first use of toxicology arsenic detection in a jury trial. The development of the first crystal test for hemoglobin using hemin crystals. The development of a presumptive test for blood. The first use of photography for the identification of criminals and documentation of evidence and crime scenes. The first recorded use of fingerprints to solve a crime. The development of the first microscope with a comparison bridge. Forensic science was significantly applied in , when doctors in London, England, were allowed to examine the victims of Jack the Ripper for wound patterns. The s Early forensic specialists were self-taught. There were no special schools, university courses or formal training. The establishment of a forensic science curricula in by Swiss Professor R. Reiss at the University of Lausanne, Switzerland, was one of the first steps towards establishing forensic science as an academic discipline. Almost every year in the s recorded an advance in the field. This century saw the: Establishment of the popular practice of using the comparison microscope for bullet comparison in the s. Development of the absorption-inhibition ABO blood typing technique in Invention of the first interference contrast microscope in by Dutch physicist Frits Zernike for which he received the Nobel Prize in Development of the chemiluminescent reagent luminol as a presumptive test for blood. Study of voiceprint identification. Invention of the Breathalyzer for field sobriety tests. Use of the heated headspace sampling technique for collecting arson evidence. Development of the scanning electron microscope with electron dispersive X-ray technology. Identification of the polymorphic nature of red cells. Enactment of the Federal Rules of Evidence Evaluation of the gas chromatograph and the mass spectrometer for forensic purposes,. Development of the polymerase chain reaction PCR technique for clinical and forensic applications. The s ended with a few DNA firsts: A criminal court case in which the admissibility of DNA was seriously challenged set in motion a string of events that culminated in a call for certification, accreditation, standardization and quality control guidelines for both DNA laboratories and the general forensic community. In , the DNA Databank legislation was enacted. By the end of the decade, significant progress had been made in the utilization of DNA analyses in casework in the State Police Laboratory System. Protecting a crime scene from contamination and gathering and interpreting evidence accurately have become some of the most critical ingredients in crime-solving. As a result, advances in technology are being applied to the finite and exacting field of forensic science, a field in which technical competency is achieved only by the synthesis of a number of factors, including training, experience, supervision, continuing education, proficiency and an appreciation of scientific methods and protocols projected against a background of stringent professional ethics. Now that we are in the 21st century, forensic science must continue to develop and mature. In recent years, the blend of science and technology has enabled police to solve many crimes that once would have been considered beyond resolution. The State Police Crime Laboratory System is at the forefront of efforts to develop new scientific crime-fighting capabilities and methods, including the use of databanks, high-tech

equipment, tele-forensics and training involving the use of simulated crime scenes. Additional Information If interested, you can learn more about: Modern forensic science by reading the descriptions in the CLS Sections. New York State Police.

Chapter 5 : History of Forensic Science

Brief History of Forensic DNA Typing â€¢ - Ray White describes first polymorphic RFLP marker â€¢ - Alec Jeffreys discovers multilocus.

Scientists, he believes, like musicians are born not made, nonetheless he acknowledges that this parental encouragement played its part in his choice of vocation. It might have been disastrous, as he explained. I consider it a badge of honour. His real enthusiasm had been for the genetic component of his degree course, though looking back now he calls it "human genetics of the stone age era". As a postdoctoral research fellow at the University of Amsterdam, his original plan was to work with yeast. It was crude but it gave us a glimpse into what human genes look like. We stumbled on the fact that mammalian genes look weird, they are not simple as in bacteria. They have gaps, so that in between the information sections of the genes were stretches of gobbledegook. Similar research led to a Nobel Prize for other teams working in the field, so you can see we were right in the centre of things. Remember I had spent seven years at Oxford, where there is a collegiate system and less sense of a university. In Amsterdam I had worked in a research institute, which was prestigious but also had a different atmosphere. I liked the compact integrated campus at Leicester. The department was friendly, there was no obvious sense of power politics. Bob Pritchard made it clear I should just get on and do my research without interference from him, and I liked that. The technology now existed for the first time to look at genes, and he decided to study their inherited variation, shifting the focus from the products of genes such as blood groups, to DNA. Those must have been exciting times in the genetics laboratory. In we discovered you could detect variations in human DNA. Then we worked on mapping genes in disease diagnosis. By we could define our goal, which was highly variable DNA. We had found a way of detecting lots of minisatellites variable enough to provide extremely informative genetic markers. We were getting extraordinarily variable patterns of DNA, including from our technician and her mother and father, as well as from non human samples. The research team immediately grasped its applications, including crime, paternity and identical twins, as well as work on conservation and diversity among non-human species. If our first case had been forensic I believe it would have been challenged and the process may well have been damaged in the courts. It was science helping an individual challenge authority. Of all the cases this is the one that means most to me. At this point, all cases were dealt with by the Leicester laboratory. Sir Alec was a research fellow for the Lister Institute who gave him funding to take on another technician to enable them to run tests on a larger scale and for two years his was the only laboratory in the world doing this work. Genetic profiling as a forensic tool At this time the forensic implications of genetic fingerprinting were emerging. The original process proved to be inadequate for this, and so from Sir Alec and his team developed a variation which they called "genetic profiling" for forensic use. Again, its first application caught the public mood. Two young girls were raped and murdered in the Enderby area of Leicestershire. A man who had been arrested had confessed to one murder but not the other, and the police decided to use genetic profiling, thinking to prove him guilty of both cases. Against all expectation he was found to be innocent of both. Then the hunt was on to find a genetic profile among the entire male population of the area that matched samples taken from the two victims. No match was found, until Colin Pitchfork was overheard boasting of how he had persuaded a friend to give a sample on his behalf. The case was solved. How did Sir Alec feel when Pitchfork was finally convicted? Also, here was a serial killer in the region who knew what I was doing and where I worked and where my family lived. That feels very uncomfortable so on a personal level it was a great relief when he was trapped. But the techniques have been speeded up and simplified. In the UK we now have a national database of 2. While there is some concern amongst civil rights activists, Sir Alec feels it would be "criminally irresponsible" not to maintain the database and would mean that rapists and murderers who are now identifiable would be able to continue unstopped. He sees this as discriminatory, though notes that this potential infringement of civil rights of minority groups would largely disappear if everybody was "fingerprinted". This is private property and no one other than the individual concerned should have that information. We all carry within us the equivalent of three lethal genetic variants, so why should insurance

companies have access to information on selected cases? The information should only be used if it helps the individual, for instance if there is a treatment for the disease. There were twins, year-old girls, who wanted to know if they were identical or not. Since identical twins are the only people who share genetic fingerprints, Sir Alec could certainly help. Once we had the results we went down to the studio, set up the DNA fingerprints behind a curtain and invited the girls to draw the curtain. They saw for themselves that they were identical. Then I had the opportunity to explain the scientific processes to an audience of 20 million people. Chernobyl Since the late s Professor Sir Alec Jeffreys has been examining the ways DNA mutates and crosses over reshuffles its chromosomes , looking at minisatellites and the spontaneous ways in which they add and lose stutters. With Professor Yuri Dubrova from the NI Vavilov Institute of General Genetics, Moscow, he has studied 79 familes in the region around Chernobyl in Belarus, the scene of the nuclear accident, to find out whether the environment we live in influences this mutation, or whether it all comes from our genes. The research concentrates on three groups of people who have been exposed to radiation: Those exposed by accident, such as survivors of the Chernobyl disaster or the bombing of Hiroshima and Nagasaki; Those deliberately exposed in the sense they live near nuclear test weapon sites; Those deliberately exposed, for example in the treatment of cancers. Results so far have been perplexing. In the Chernobyl region the genetic mutation rate was found to be unusually high. In other words parents in that area pass on mutations to their children more than elsewhere. But it is impossible to point the finger of accusation at radiation alone. However, those living near nuclear weapon test sites also show increased levels of heritable mutation, suggesting a direct effect of radiation. On the other hand sperm from men undergoing radiation for cancer treatment shows no change in genetic mutation at all, nor do samples from the remaining survivors of Hiroshima and Nagasaki. Questions to be explored include whether Chernobyl families living in more contaminated areas show more genetic mutation than those in clearer districts, or whether the way people receive the radiation is significant, i. It is a project that will, Sir Alec foresees, take him to retirement. For a scientist who enjoys venturing into the unknown he seems well content to take up the challenge.

Chapter 6 : Crime Laboratory System: Forensic Science History

The introduction of DNA analysis to forensic science brought with it a number of choices for analysis, not all of which were compatible. As laboratories throughout Europe were eager to use the new technology different systems became routine in different laboratories and consequently, there was no basis for the exchange of results.

In , Darwin had joined a five year scientific expedition. The breakthrough came when he noted that the Galapagos Islands each supported its own variety of finch, which were closely related but had slight differences that seemed to have adapted in response to their individual environments. On his return to England, Darwin proposed a theory of evolution occurring by the process of natural selection, which he then worked on over the following 20 years. The Origin of Species was the culmination of these efforts and argued that the living things best suited to their environment are more likely to survive, reproduce and pass on their characteristics to future generations. This led to a species gradually changing over time. Whilst his study contained some truth many areas such as the link between animal and human evolution are being shown to be untrue through new discoveries of ancient ancestors. The book was extremely controversial, as it challenged the dominant view of the period that many people literally took that God had created the world in seven days. It also suggested that people were animals and might have evolved from apes this part of his work has been shown to be inaccurate. To Ponder; One must simply consider the fact that through thousands of years of evolution animals have the highest respect for their body yet people do not respect their bodies. The cheetah will go hungry rather than push itself beyond the point it can recover. If people had evolved from animals over millions of years the innate respect for their body would still be here today. View the slide - Gregor Mendel discovers the basic principles of genetics In , an unknown Augustinian monk was the first person to shed light on the way in which characteristics are passed down the generations. Today, he is widely considered to be the father of genetics. However, he enjoyed no such notoriety during his lifetime, with his discoveries largely passing the scientific community by. In fact, he was so ahead of the game that it took three decades for his paper to be taken seriously. Between and Mendel conducted experiments on pea plants, attempting to crossbreed "true" lines in specific combinations. He identified seven characteristics: He found that when a yellow pea plant and a green pea plant were bred together their offspring was always yellow. However, in the next generation of plants, the green peas returned in a ratio of 3: So, in the previous example, the green trait was recessive and the yellow trait was dominant. View the slide - Friedrich Miescher identifies "nuclein" In , Swiss physiological chemist Friedrich Miescher first identified what he called "nuclein" in the nuclei of human white blood cells, which we know today as deoxyribonucleic acid DNA. To do this, he had made arrangements for a local surgical clinic to send him pus-saturated bandages, which he planned to wash out before filtering the white blood cells and extracting their various proteins. However, during the process, he came across a substance that had unusual chemical properties unlike the proteins he was searching for, with very high phosphorous content and a resistance to protein digestion. Miescher quickly realised that he had discovered a new substance and sensed the importance of his findings. Despite this, it took more than 50 years for the wider scientific community to appreciate his work. In the frenzy of research that followed, one line of thought branched off into social theory and developed into eugenics. This was an immensely popular movement in the first quarter of the 20th century and was presented as a mathematical science, which could predict the traits and characteristics of human beings. The darker side of the movement arose when researchers became interested in controlling the breeding of human beings, so that only the people with the best genes could reproduce and improve the species. It shows the dangers that come with practicing science without a true respect for humanity as a whole. Many people could see that the discipline was riddled with inaccuracies, assumptions and inconsistencies, as well as encouraging discrimination and racial hatred. However, in it gained political backing when the Immigration Act was passed by a majority in the U. When political gain and convenient science combine forces we are left even further from truth and a society that respects those within in. With continued scientific research and the introduction of behaviourism in , the popularity of eugenics finally began to fall. The horrors of institutionalized eugenics in Nazi Germany which came to light after the

2nd World War completely extinguished what was left of the movement. It took three decades for Mendelian theory to be sufficiently understood and to find its place within evolutionary theory. Whilst studying the human disorder alkaptonuria, he collected family history information from his patients. Through discussions with Mendelian advocate William Bateson, he concluded that alkaptonuria was a recessive disorder and, in , he published The Incidence of Alkaptonuria: A Study in Chemical Individuality. This was the first published account of recessive inheritance in humans. These discoveries were some of the first milestones in scientists developing an understanding of the molecular basis of inheritance. The man who made the breakthrough was Oswald Avery, an immunochemist at the Hospital of the Rockefeller Institute for Medical Research. Avery had worked for many years with the bacterium responsible for pneumonia, pneumococcus, and had discovered that if a live but harmless form of pneumococcus was mixed with an inert but lethal form, the harmless bacteria would soon become deadly. Determined to find out which substance was responsible for the transformation, he combined forces with Colin MacLeod and Maclyn McCarty and began to purify twenty gallons of bacteria. He soon noted that the substance did not seem to be a protein or carbohydrate but rather a nucleic acid, and with further analysis, it was revealed to be DNA. Although the paper was not widely read by geneticists at the time, it did inspire further research, paving the way for one of the biggest discoveries of the 20th century. The paper had a huge impact on Chargaff and changed the future course of his career. I resolved to search for this text. Chargaff was determined to begin work on the chemistry of nucleic acids. His first move was to devise a method of analysing the nitrogenous components and sugars of DNA from different species. Chargaff continued to improve his research methods and was eventually able to rapidly analyse DNA from a wide range of species. In , he summarised his two major findings regarding the chemistry of nucleic acids: She worked with the scientist Maurice Wilkins, and a student, Raymond Gosling, and was able to produce two sets of high-resolution photographs of DNA fibres. Using the photographs, she calculated the dimensions of the strands and also deduced that the phosphates were on the outside of what was probably a helical structure. Bernal, and between and her research came close to discovering the structure of DNA. Unfortunately, she was ultimately beaten to the post by Thomas Watson and Frances Crick. Despite an age difference of 12 years, the pair immediately hit it off and Watson remained at the university to study the structure of DNA at Cavendish Laboratory. Using available X-ray data and model building, they were able to solve the puzzle that had baffled scientists for decades. They published the now-famous paper in Nature in April, and in they were awarded the Nobel Prize for Physiology or Medicine along with Maurice Wilkins. She died in , after a short battle with cancer. He handpicked 20 members - one for each amino acid - and they each wore a tie carrying the symbol of their allocated amino acid. Ironically, the man who was to discover the genetic code, Marshall Nirenberg, was not a member. However, it took decades for cytogenetics the study of chromosomes to be recognised as a medical discipline. In the late s and early 70s, stains such as Giemsa were introduced, which bind to chromosomes in a non-uniform fashion, creating bands of light and dark areas. The invention transformed the discipline, making it possible to identify individual chromosomes, as well as sections within chromosomes, and formed the basis of early clinical genetic diagnosis. View the slide - Marshall Nirenberg is the first person to sequence the bases in each codon In , Marshall Nirenberg arrived at the National Institute of Health as a postdoctoral fellow in Dr. The following few years were taken up with experiments, as Nirenberg tried to show that RNA could trigger protein synthesis. By , Nirenberg and his post-doctoral fellow, Heinrich Matthaei were well on the way to solving the coding problem. Nirenberg and Matthaei ground up E. Coli bacteria cells, in order to rupture their walls and release the cytoplasm, which they then used in their experiments. These experiments used 20 test tubes, each filled with a different amino acid - the scientists wanted to know which amino acid would be incorporated into a protein after the addition of a particular type of synthetic RNA. In , the pair performed an experiment which showed that a chain of the repeating bases uracil forced a protein chain made of one repeating amino acid, phenylalanine. This was a breakthrough experiment which proved that the code could be broken. Nirenberg and Matthaei conducted further experiments with other strands of synthetic RNA, before preparing papers for publication. However, there was still much work to do - the scientists now needed to determine which bases made up each codon, as well as the sequence of bases within the codons. Around the same time, Nobel laureate Severo Ochoa was also

working on the coding problem. This sparked intense competition between the laboratories, as the two scientists raced to be the first to the finish line. Finally, in , Nirenberg became the first person to sequence the code. In , his efforts were rewarded when he, Robert W. View the slide - Frederick Sanger develops rapid DNA sequencing techniques By the early s, molecular biologists had made incredible advances. They could now decipher the genetic code and spell out the sequence of amino acids in proteins. However, further developments in the field were being held back by the inability to easily read the precise nucleotide sequences of DNA. In , Cambridge graduate Frederick Sanger started working for A. Chibnall , identifying the free amino groups in insulin. Through this work, he became the first person to order the amino acids and obtain a protein sequence, for which he later won a Nobel Prize. He deduced that if proteins were ordered molecules, then the DNA that makes them must have an order as well. He initially began working on sequencing RNA, as it was smaller, but these techniques were soon applicable to DNA and eventually became the dideoxy method used in sequencing reactions today. For his breakthrough in rapid sequencing techniques, Sanger earned a second Nobel Prize for Chemistry in , which he shared with Walter Gilbert and Paul Berg. As the disease is adult onset, many people have already had children before they are diagnosed and have passed the mutant gene onto the next generation. In , a genetic marker linked to HD was found on Chromosome 4 , making it the first genetic disease to be mapped using DNA polymorphisms. However, the gene was not finally isolated until View the slide - The first gene found to be associated with increased susceptibility to familial breast and ovarian cancer is identified In , the first gene to be associated with increased susceptibility to familial breast and ovarian cancer was identified. Scientists had performed DNA linkage studies on large families who showed characteristics related to hereditary breast ovarian cancer HBOC syndrome. They named the gene they identified, which was located on chromosome 17, BRCA1. However, it was clear that not all breast cancer families were linked to BRCA1, and, with continued research, a second gene BRCA2 was located on chromosome If a person has 1 altered copy of either gene it can lead to an accumulation of mutations, which can then lead to tumour formation. The Human Genome Project officially started in , with the U. Many organisations had a long-standing interest in mapping the human genome for the sake of advancing medicine, but also for purposes such as the detection of mutations that nuclear radiation might cause. View the slide - Haemophilus Influenzae is the first bacterium genome sequenced In , to demonstrate the new strategy of "shotgun" sequencing, J. Craig Venter and colleagues published the first completely sequenced genome of a self-replicating, free-living organism - Haemophilus Influenzae.

Chapter 7 : A Brief History of Forensic Examinations of Auschwitz

Mnookin notes that the one area of forensic science in which you will see experts testifying about probability is DNA Testing. Not coincidentally, DNA testing is one area of forensics that was.

A Whole New World: Scientists discover abundant viruses living under the sea It is You find patterns within these sequences that are hereditary but highly variable between individuals. Before long, you discover the potential to identify a person using these distinctive patterns within DNA. Fast forward 30 years, your game-changing discovery has helped convict criminals, exonerate the innocent, and identify countless victims. Alec Jeffreys, discoverer of DNA fingerprinting. Image courtesy of Wikimedia Commons. One of the first documented uses of physical matching occurred in , when an Englishman was convicted of murder because a piece of newspaper in his pocket matched the wadded paper in a pistol. By the 19th century, sufficient scientific advances including fingerprint classification, toxicology assays, and trace evidence analysis had been made to spark a forensic revolution. A simultaneously occurring movement towards an analytic, technology-based approach to fighting crime gave birth to modern forensics. Physical fingerprinting made its way to the US by , but it was not until 80 years later that a case was solved with DNA fingerprinting. The first application in a forensic case occurred in , when a man was implicated in a rape crime. In the last 10 years alone, fingerprinting methods have improved substantially with the advent of portable crime labs and the increased use of chemical analysis. These fragments are then separated by size with a process called agarose electrophoresis, which capitalizes on the negative charge of DNA by attracting it towards a positive charge. As DNA fragments migrate on a gel, shorter segments travel faster than longer ones. This movement of DNA is later visualized using radioactive probes that stick to the fragments. There were many drawbacks to the early methods of DNA fingerprinting, including DNA quality issues, statistical errors, and a difficulty obtaining optimal samples from crime scenes. To address these limitations, newer techniques have been developed. Starting in the early s, DNA fingerprinting methods gradually became based on polymerase chain reactions PCR , a technology that selectively amplifies a small sample of DNA to generate thousands to millions of copies of a particular sequence. Using PCR has improved sensitivity, speed, and genotyping precision. Analysts also began to study short tandem repeats, repetitive sequences of DNA, because of their variation among individuals. In fact, the odds exceed one in a billion. Forensic science circa So where, one might ask, does the future of forensics lie? With the emergence of next generation sequencing technologies, many believe that DNA sequencing, which actually identifies each base pair A, T, C, G in the genome, will replace current methods based on fragment length analysis. The cost of sequencing has fallen dramatically, and if accuracy and reliability continue to increase, the process will become fast, automated, and perhaps even possible on-site. So if you commit a crime anytime soonâ€”you will likely be caught.

Chapter 8 : History of Forensics | HowStuffWorks

Forensic Science History The Early Years. Without question, the field of forensic science has come a very long way since its recorded beginnings in the s, when the Chinese used fingerprints to establish the identity of documents and clay sculptures.

Alec Jeffreys , a geneticist from the University of Leicester in Great Britain was studying hereditary diseases in families. He was focusing on methods to resolve paternity and immigration disputes by demonstrating the genetic links between individuals. He soon realized that this variation could be used to establish the identity of a person and he named his technique genetic fingerprinting. Jeffreys demonstrated that a genetic fingerprint is specific to each individual and the pattern does not belong to any other person on earth except for identical twins. For the first time, genetic fingerprinting would be used to exonerate a suspect and convict the guilty person. The quiet little village of Narborough in Leicestershire, East of Birmingham, would be put on the forensic map when two crimes shocked residents and law enforcement. In , year-old Lynda Mann was found raped and murdered. Three years later, Dawn Ashworth, also fifteen, was also raped and murdered. Jeffreys was asked to compare semen samples from both murders against a blood sample from a seventeen year old suspect, Richard Buckland, who was in police custody and who had confessed to the second crime. This confession raised suspicion among some detectives, as Buckland had to be 14 years old when he committed the first crime. It also proved that the same killer was responsible for both crimes. With this information, law enforcement then took an unprecedented task to catch the killer. The first DNA dragnet was used. A local baker named Colin Pitchfork avoided having his blood tested. Then Pitchfork had Kelly submit his own blood for him. Months later his ploy was discovered by law enforcement when a resident came forward after hearing a conversation at a local pub in which Kelly admitted that he was paid by Pitchfork to have his blood tested. This led to the arrest of the twenty seven-year old Pitchfork. It was a perfect match. Instead of going to trial, Pitchfork pled guilty to both rapes and murders. In , Pitchfork became the first person in the world to be identified, captured and successfully prosecuted as a result of DNA evidence. He was sentenced to life, minimum term of 30 years, and is currently in prison for both murders. In May , Pitchfork had his life sentenced reduced by 2 years.

Chapter 9 : The history of genetic fingerprinting â€" University of Leicester

In September , Dr. Alec Jeffreys, a geneticist from the University of Leicester in Great Britain was studying hereditary diseases in families. He was focusing on methods to resolve paternity and immigration disputes by demonstrating the genetic links between individuals.

The aim of this section of the website is to highlight notable forensic landmarks and developments. In the 5th century Germanic and Slavic societies were believed to be the first to put down in statute that medical experts should be employed to determine cause of death. In the first textbook on forensic medicine was published in China which among others things documented the procedures to be followed when investigating a suspicious death. In medieval England pressure from the church halted the practice of hanging women thought to be pregnant. Inspired by the study of anatomy medicolegal textbooks begin to appear by the end of the 16th century. The Rise of Forensic Medicine Information courtesy of The National Library of Medicine Forensic medicine, also called "medical jurisprudence" or "legal medicine," emerged in the s. As European nation-states and their judicial systems developed, physicians and surgeons participated more frequently in legal proceedings. By the late s, medical jurisprudence had become a standard subject in the medical curriculum. In the early s, Parisian medical professor Mathieu Orfila and others began to intensively study poisons and the decomposition of bodies. These early treatises discussed medical questions commonly treated in courts: How could one determine whether an infant was stillborn or the victim of infanticide? Whether a woman was a virgin? Whether a body found in water was someone who had drowned or the victim of a disguised homicide? Proliferating Specialties In the early s, forensic medicine was not divided into distinct disciplines. Physicians and surgeons who performed autopsies and testified in court depended on a variety of sources for their income and provided expertise as needed. No regular system of payment was provided for expert testimony , laboratory analysis, or postmortem examination. Toxicology and forensic pathology were just emerging as distinct fields, and most autopsies were performed by physicians without any special training. Post-Mortem Examination In cases of homicide or suspicious death, in medieval England, the coroner, an appointed official who had no medical training, was required to make "a view of the body," a legal, visual inspection. Since then, medical professionals have played an increasingly important role in making views of the body. Physicians and surgeons have developed methods of seeing into the body through autopsy and post-mortem examinationâ€"making visible what the untrained, unequipped eye cannot see. Post-mortem dissection, or autopsy, was among the earliest scientific methods to be used in the investigation of violent or suspicious death. Autopsy remains the core practice of forensic medicine. These clips from training films show some of the procedures of postmortem examination. After visual examination of the body cavities, the examiner removes parts for chemical analysis, inspection with a microscope, and other tests. Tools and tool kits specially adapted for use in autopsy first appeared in the early 19th century. Changes After Death Physicians and surgeons first gained practical knowledge of death and decomposition through handling and dissecting bodies obtained for anatomical study. Over the course of the 19th and 20th centuries, the study of the decomposed body and body partsâ€"the effects of time, environment, and manner of deathâ€"became a vital part of forensic science. Fauna of the Cadaver and Time of Death In the 19th century, medico-legal researchers began studying patterns of insect colonization of the cadaver. Entomology , the study of insects, became one of the forensic sciences. By identifying the particular stages that insects go through as they develop on a dead body, and the succession of different species, forensic investigators attempt to determine where a victim died and estimate the time elapsed since death. These adult specimens represent some of the different insect species that colonize a cadaver. Toxicology As commercially manufactured poisons became increasingly available in the 19th century, poisoning became known as a "modern" and disturbingly hard-to-detect method of killing. In response, researchers developed toxicology as a specialized field of forensic medicine, and devised specific tests for poison, most famously the Marsh Test for arsenic. The new science of toxicology was plagued by difficulties. In the courtroom and laboratory, seemingly reliable tests were shown to be flawed. Microscopy Midth-century improvements enabled physicians to use microscopy in

criminal investigations. The microscope made it possible to view tiny lesions, crystals, microorganisms, and the characteristics of hairs and fibers. Spectroscopy Spectroscopy was born in the midth century, when Isaac Newton discovered that a prism divides white light into constituent colors. Subsequent researchers discovered that specific substances, subjected to flame, give off unique patterns of light that show characteristic "emission" bands and "absorption" lines when cast through a prism. By the s and s, spectroscopy seemed a promising new forensic technology. Further work on spectra analysis led to spectrophotometry and, more recently, mass spectrometry. In tandem with gas chromatography, mass spectrometry is now often used to identify and match organic and inorganic substances for forensic purposes. Fingerprints The first practical application of fingerprinting as a unique individual identifier came in the s. Sir William Herschel, a colonial administrator in British India, used fingerprints to detect false pension claims. In an case in Argentina, Juan Vucetich became the first investigator to use fingerprints to help secure a conviction for murder. A useable classification system was necessary before forensic fingerprinting could be put to practical use. In the s and early s, Vucetich in Argentina, and E. Henry in British colonial India and Great Britain, separately devised such systems. After a series of dramatic cases proved its merits, fingerprinting spread rapidly. A Great Read A crime scene. The most important person on the scene? And yet the intricate details of criminal forensics work remain a mystery to most of us. In a book that is by turns fascinating and chilling, Nigel McCrery leads readers around the world and through two centuries to relate the history of forensics in accessible and entertaining prose. He introduces such colorful characters as Dr. All the major areas of forensics, including ballistics, fiber analysis, and genetic fingerprinting, are explained with reference to the landmark cases in which they proved their worth, allowing readers to solve the crimes along with the experts. Whether detailing the identification of a severed head preserved in gin, the first murder solved because of a fingerprint, or the first time DNA evidence was used to bring a sadistic killer to justice, Silent Witnesses provides dramatic practical demonstrations of scientific principles and demonstrates a truth known by all forensic scientists: See following link for full details.