The World’s Greatest Detective: Science versus Comics
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Crime Scene to Courtroom: Forensic Science for Lawyers
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THE CASE

The Dark Knight surveyed the alley from a nearby rooftop, where a body was sprawled on the floor. He glided down to the alley, landing with a soft crunch on a thin layer of ice. His cape and boots touched the floor, as he swooped down and made his way to the body. He switched the "detective mode" on in his cowl, which altered his goggles’ vision and allowed him to view the crime scene in various wavelengths of light, thereby picking up key evidences that may not be visible to the naked eye under the normal visible spectrum. He scanned the crime scene using the different spectra, which highlighted the bloody bandages around the victim’s face and the pool of blood next to the body.
After analyzing the bandages and the blood, the World’s Greatest Detective concluded that the victim’s face had been removed, and that the blood belonged to the victim as well. After matching the manner in which the victim died with other records maintained by the police, Batman discovered that several murders with the same *modus operandi* had taken place over the past few months, and that the press had nicknamed the perpetrator of these crimes "The Identity Thief." Upon analyzing the blood sample on the crime scene, Batman configures his "detective mode" to track the blood particles in the air, which should lead him to the last person who had been in contact with the victim's blood and maybe the last person to see the victim alive, [maybe] even the killer himself.

Upon tracking the blood particles across the city, Batman finds a homeless person who claims that Bruce Wayne dumped the body of the victim, and that he saw him do so. The witness went to check on him, and that is how he got the victim's blood on his hands, which led Batman to him.

Batman then finds another victim, who seems to have died due to similar causes; the victim’s face was removed with surgical precision, which led Batman to believe that these murders were definitely premeditated, and were not random. Batman then scans a scalpel that he finds at the crime scene for fingerprints, and matches it with the criminal records of Gotham City, but it yields no match. Batman asks his trusted partner, Oracle (a technological wizard), to test the fingerprint against every fingerprint in the Gotham City Database, and is informed that the fingerprint on the scalpel belongs to Bruce Wayne.
Batman then finds a third victim and it is revealed after scanning that this victim had had his face removed with surgical precision as well, and finds that the crime scene was cleaned with bleach. Batman then configures his detective vision mode to track the bleach particles in the air, which led him to a man who claims he was instructed to dump the victim’s body and clean the scene with bleach. This accomplice claims that it was Bruce Wayne who instructed him to do so, and even tells Batman where he is operating out of. Upon reaching "Bruce Wayne’s" base of operations, Batman discovers that the killer had been surgically removing different parts of different people’s faces and surgically grafting them onto his face to look like Bruce Wayne, and altered his fingerprints to look like Bruce Wayne’s, in order to frame him for these murders.

**POSTMORTEM OF THE FORENSICS**

Forensic Science is integral to solving crimes in today’s world, and has been since the inception of the science. Forensic Science uses different methods of identification, such as fingerprints and DNA, to determine who was present at the crime scene. Along with other such indicative evidence, we can determine who was responsible for committing a certain crime. Even though the application of forensic science is not as foolproof as shown in popular television and cinema, the principles that form the basis of the science certainly are.

The techniques and technologies used by the fabled Dark Knight in his crime fighting and case solving endeavors are highly advanced and largely fictitious. Yet, it is important to note that there is a certain amount of forensic accuracy (as well as fallacy) in the way he goes about solving the case.
In the above case, the Dark Knight fails to account for what is perhaps the most basic tenet of forensic science, whether it be for collecting evidence or leaving behind key evidence while committing a crime: "every contact leaves a trace." The Dark Knight brazenly walks onto the crime scene, not accounting for the fact that with all the places he (and his suit) has been to, his suit would not be able to prevent contamination of the crime scene. Yet, upon reaching the crime scene and walking around it, Batman manages to analyze the face of the victim and the blood present on the crime scene without collecting any samples.

If real C.S.I. personnel were to be present at the same crime scene, he/she would have to wear a sterile suit that covered their entire body just before entering the scene in order to ensure that no contamination is done due to any acts of the person collecting the evidence, or that existing evidence is not destroyed or carried away by any personnel on the crime scene.

Furthermore, it is good practice to collect samples of the blood from the crime scene to confirm the analysis, and even manually inspect the body to determine that the injuries were inflicted with surgical precision and that the scalpel found matched the marks of the instrument used to remove the face of the victim.

It is imperative while collecting and analyzing evidence at the crime scene, that it is not destroyed while surveying the crime scene and collecting various evidence. Using leather gloves to lift evidence may prevent transfer of his fingerprints onto the evidences but can risk erasing of fingerprints from metal and other such surfaces. Such evidences will thus have to be lifted carefully from edges not likely to have fingerprints to prevent erasure. However, using the same glove to investigate various crime scenes, as well as objects from the same crime scene, can lead to cross-contamination of scenes.
The Dark Knight then switches on his revolutionary technology—"detective mode" of multi-spectra vision to detect various evidences at the crime scene. In fact, he relies heavily on this, as it is used to analyze essentially every evidence he finds at all the crime scenes, from the blood of the victim, to the fingerprint on the scalpel, to the bleach used to clean the crime scene.

Surprisingly, the technology to detect all the above-mentioned evidences using just different wavelengths of light does exist in reality and is quite possible and within the scope of today’s technology. It is possible to detect certain samples, such as blood, semen, etc., on crime scenes using substances such as luminol and contrasting the crime scene with different wavelengths of light such as UV light. Crime Scene Investigator Birgitta Jansson of the Swedish Police witnessed first-hand the effectiveness of chemicals such as Luminol, and using different wavelengths such as UV lights for detecting semen at a crime scene covered with snow: "The light made the semen fluoresce in the snow, to an extent that I never thought was possible. Actually, I was amazed that it worked. I never thought you could distinguish semen from the snow with the help of high intensity UV Light. And there was no doubt—the fluorescence was incredibly strong and clear. I have never seen anything like it."

Purdue Portable Mass Spectrometer

Furthermore, with the advancements being made in technology in today’s world, it is becoming increasingly possible to not only detect various evidence using substances such as luminol and UV light, but it is also possible to analyze minute traces of such evidences. According to KonicaMinolta.us, it is possible to analyze trace evidence on field through the use of spectroscopy:

"Spectroscopy has proven to be a non-destructive method for successfully analyzing different bodily fluids as well as other types of forensic materials such as drugs or fingerprints. This allows the evidence to be tested while still preserving it. It also utilizes portable instrumentation making it easy to do the testing right at the location of a crime without even removing the evidence.
from the scene. Another advantage is that a specimen does not require any preparation to be evaluated by a spectrophotometer. In order to identify samples, such as type of body fluid, the spectrophotometer compares samples to data within a spectral library."

In fact, mass spectroscopy is increasingly becoming the go-to method for analysis of evidence, since it is convenient and doesn’t destroy evidence. The people at SeattlePi.com explain how exactly mass spectroscopy works: “Mass spectroscopy, also called mass spectrometry, is a scientific method that analyzes a sample of material to determine its molecular makeup. By ionizing a sample, a scientist can cause it to separate into its individual ions. This allows him to analyze and categorize those ions to determine the sample's composition. Mass spectrometry has become a valuable tool in forensic science, where it can provide clues from the barest traces left by a suspect.”

It seems that the Dark Knight’s technique of analyzing key evidences, such as the blood sample, fingerprint and bleach, in the field and in a short span of time is an actual reality in forensic labs as well. However, the ability to do so from material suspended in air, without actually collecting and concentrating any evidence, is something that currently only Batman has the technology to do.

It is interesting to note that, once Batman discovered the real killer and his plan was revealed, it becomes known that the killer wished to frame Bruce Wayne by planting evidences at the crime scene that would be uniquely specific to Wayne.

The "Identity Thief’s” plan was to copy Bruce Wayne's fingerprints, graft Bruce Wayne’s face onto his own (much like the cult classic *Face Off*), and commit crimes, leaving behind key evidences that would inculpate Bruce Wayne once found at crime scenes, like the fingerprints on the scalpel. The question that one might ask is, is it really possible to copy someone’s fingerprint, and graft their face on to your own?
Fingerprints are universally agreed to be unique, i.e., no two people can have the same fingerprint. However, the F.B.I. have faced difficulties in matching fingerprints because repeat offenders would temporarily alter their fingerprints to escape detection. According to ForensicMagazine: “In a study last year, the FBI identified 412 records in the Integrated Automated Fingerprint Identification System which showed deliberate print alteration, they said. The biggest number of altered prints appeared to be by people who had extensive criminal records and multiple law enforcement encounters, the study found.” While it is possible to temporarily alter fingerprints, it is not possible to permanently change your fingerprint structure barring deep scarring or endothelial damage.

Therefore, though it was possible for the "identity thief" to temporarily alter his fingerprint, it does not seem feasible to convert one’s fingerprints to another's. Since the pattern that causes the furrows and ridges in the fingerprints is formed in the subcutaneous layer of the skin, this cannot be superficially altered by grafting.

As for the question of grafting someone else's face onto another person, a published interview with Dr. D reveals that it is possible to graft someone's face onto another person's. However, there are several conditions that need to be satisfied in order for such a "transplant" to take place successfully: “Like any organ transplant, it would take months to fully heal. I mean, you’d have to have the same blood type and a match. You’d need what's called an 'immune match' and you’d need a tissue match, too. It wouldn't be like Face/Off.” It is unlikely that the killer would have found as many victims matching his type without already arousing the suspicion of law enforcement, and there are chances that he would have to be heavily medicated on immuno-suppressants post the operation, which in turn would make him vulnerable to all kinds of infections and diseases.

It seems that the killer's plan was not a very clever one, given that simply grafting Bruce Wayne's face onto his own would not implicate Bruce Wayne undeniably since eye-witness testimony is fallible and that Mr Wayne would likely have an alibi for one or more of the crimes committed. However, a case can be made for use of accomplices in executing the crime, in which case the defense team would have a more difficult time proving Mr. Wayne’s innocence.

As we can see here, forensics is a tool that can be used both by the avenging justice seeker as well as by the intelligent criminal. Though some of the technology used by the World's Greatest Detective are currently not real, their conception might not be as far-fetched as they may initially seem. With the advent of various technologies and techniques, it may indeed be possible that anyone could be Batman.