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Introduction

Social studies of science and forensic genetics have focused on the use of DNA technology in the criminal justice system (Jasanoff, 2006; Lynch *et al.*, 2008; Kruse, 2012, 2016) in recent decades and how it has challenged the *epistemic status* of traditionally used evidence.

The meaning attributed to the evidence during the trial is based on traces collected at the crime scene and depends on the prelegal investigation done by the police (Kruse, 2012; Jasanoff, 2006; Wyatt, 2014a). The “practices of interpreting and assembling evidence” (Kruse, 2012, 300) are located at the crime scene along with the moment of selection, recording and storage of the forensic artifacts that are crucial in the trajectory of the trace (Costa 2015; Costa 2014; Machado and Costa 2013) and in the chain of custody of the evidence.

The police are the first element of the chain of custody, “the entire sequence of agents and practices involved in the identification, collection, transportation, storage, and handling of evidence to certify its identity and credibility” (Lynch *et al.*, 2008, 11). as they are responsible for constructing the first narrative of the criminal event. The performance of this narrative is reflected not only in its arena but also in the different social and technical arenas (Wyatt, 2014a) that comprise the chain of custody.

Forensic evidence is part of an *apparatus* that consists of traces, bodies, technologies, legal practices and cultural understandings (Lynch *et al.*, 2008), which combine to allow the construction of a narrative about a particular event (Kruse, 2010, 2012; Prainsack and Toom, 2013). In this sense, justice bodies are simultaneously material and social (Kruse, 2016), as separating these bodies from their material *template*¹ and their sociocultural *inscriptions* is impossible (Latour, 1987).

In this sense, forensic evidence consists of both forensic and contextual artifacts being an inseparable part of legal, technological and social practices (Kruse, 2016). Maintained by heterogeneous practices, forensic evidence is also co-produced in the biolegal narrative (Lawless, 2011).

The documents produced by the police communicate between different *epistemic cultures* (Knorr-Cetina, 1999) - cultures that create and share knowledge, which end (hopefully) with a verdict in court. In the trajectory from the crime scene to the court, several actors create knowledge: police officers, forensic scientists, lab technicians, public attorneys, and judges. This knowledge is also created in diverse arenas: police station, laboratory and court. It is in the court that the judge evaluates the evidence produced along the trajectory.

Forensic science plays an important role in helping to transform traces at the crime scene into forensic artifacts, that is, objects of knowledge combining legal and scientific research, which allows those objects to be analyzed in court as forensic evidence (Wyatt, 2014a). It becomes visible for the first time in the court (Kruse, 2016), but it begins to be *constructed* at the crime scene through police work, dependent on the reference frameworks of the person who tells the stories (Kruse, 2012; Toom, 2012). Being constructed in a way means that it could be constructed other different way².

These chains of custody are not only made up of traces. They are also crossed by organizational contingencies based on the strategies used by different epistemic cultures and their incorporated social understandings (Wyatt, 2014a), which depend on the enactment of formal or tacit knowledge (Polanyi, 1964), turning visible some artifacts and keeping invisible or in a twilight zone other artifacts.

Looking at the visibilities, invisibilities and twilight zones I will try to understand how police forces at the crime scene in Portugal construct their narratives through the use of biological traces and how the narratives allow to construct the evidence.

This paper is divided into three parts. In the first part, it is highlighted how forensic evidence combines scientific practices, which gives it the objectivity needed to have legal value (forensic artifacts), and administrative practices (contextual artifacts), which guarantee the credibility of scientific evidence in court. I also examine how tacit knowledge, based on action rules and sociocultural understandings, allows the creation of knowledge. Not only are the enacted *mundane practices* part of the sociocultural understandings (Lynch *et al.*, 2008), but so is the *professional vision* (Goodwin, 1994). In the second part I shortly explain the criminal investigation in Portugal and some of its legal framework and specificities. After that, in the third part I present a narrative of three legal cases and produce an analysis of each case. Case 1 concerns to an attempted homicide, case 2 concerns to a simple theft and case 3 presents a qualified theft.

I argue that in criminal investigations in Portugal, the production of a narrative with legal meaning in court can be conditioned by the co-existence of the epistemic subcultures of police work (different police forces at the crime scene) that have different knowledge, practices, understandings and ways of “seeing” the forensic evidence. The degree of *technological enthusiasm* that guides the performance of different police forces at the crime scene is reflected in the way they “see” the scene and in the sociocultural understandings that they produce. This *technological enthusiasm* and what I call here “selective professional vision” are mobilized at the crime scene and can impact the robustness and efficiency of the evidence presented in court.

1. Forensic artifacts, contextual artifacts and the mundane action

Science creates the ability to document, see and register images of a crime. Through the use of rigid protocols and the harmonization and standardization of procedures, *mechanical objectivity* (Porter, 1996, 9) can be applied to the crime scene, allowing it to be seen without interference in the final result (Daston and Galison, 2007, 17). Through the guidance of harmonized and standardized patterns of collection, storage and the analysis of biological traces at a crime scene, the scientification of police work (Williams and Johnson, 2008) gains legitimacy and credibility in the legal context. The application of these patterns can be an important contribution to ensuring that the requirements demanded by science are met in court and thus bring a greater scientificity to evidence in court, often based on fragile evidence (such as testimonial evidence).

The crime scene reports, the inspection reports, the photographic reports, and the order in which photos are displayed can all be considered contextual artifacts (Wyatt, 2014a,b) that help to give objectivity to the work developed by the police at a crime scene. Thus, through methodical and structured actions, these artifacts contribute to the production of knowledge by the police, legitimizing police intervention in that space.

Any item created at or removed from the scene is registered, and the police intervention is ordered and contextualized. The report not only describes the crime and the physical environment but also provides more information related to the forensic artifacts removed from the crime scene.

The crime scene report presents a literal narrative (Wyatt, 2014a) that is relevant to understanding how police forces are trained in ways of “seeing”³ the space, taught to document it on a worksheet and use conditional language in order to remain coherent.

In addition to the report, the use of photos allows the police to not only reinforce coherence but also register “objectively” and contribute to the narrative. Paper trails affirm the role of police in the criminal space and circumscribe police action fields and professional competence by demonstrating that they have followed a set of established procedures. However, if the photographic practice relies on the illusion of a lack of human intervention (Wyatt, 2014a), it can be disclosed to subjectivities.

When arriving at a crime scene, the police officer in attendance triggers his power decision based on the concrete context, which may vary depending on the situation. If one part of the formalized work addresses the previously established rules, another part does not depend on formal procedures.

To address a forensic artifact, “mechanical objectivity” allows the production of robust knowledge. However, the production of the artifact depends on the enactment of decision-making processes (van den Eeden, 2016) in a given space and time that will allow the production of documents with the capacity to be validated either by science or by legal meaning (Wyatt, 2014a).

In this sense, only a part of the scientification can be considered a product of “mechanical objectivity” and submitted to the rigors and protocols of science. The other part of the scientification of police work is connected to what Lynch *et al.* (2008, 114) call “administrative objectivity” processes, which are founded on the bureaucratic rules inherent to the daily practices of the institutions (Lynch *et al.*, 2008, 66).

The credibility of the evidence can become vulnerable through the enactment of the improved administrative practices on which it is based ((Lynch *et al.*, 2008; Wyatt, 2014a). Depending on the compliance with rules as well as the *mundane* action (Wyatt, 2014) becomes more susceptible to detracting from the process of the scientification of police work.

Both the production of forensic artifacts and the production of contextual artifacts are dependent on the interpretation of the observer, sociocultural understandings, and thus the personnel idiosyncrasies of each police officer who is confronted with a criminal scenario. In that sense, distinguishing between formal and tacit knowledge as well as visible and invisible knowledge is important.

According to Star and Strauss (1999), visible knowledge is associated with formal knowledge and invisible knowledge is associated with tacit or informal knowledge. When a police officer documents a process with a written report and photos of the crime scene, he is not only giving visibility to the space but also allowing a greater inspection of his actions and a greater surveillance of his work (Wyatt, 2014a). Thus, his role will be to make impure and invisible objects into visible ones.

However, visibility is not provided for everything that is invisible. Some of these things gain visibility through the photos of the crime scene and the written reports; another part of the daily work is kept invisible. Some part of the daily work come to light in one moment but other part is kept in a twilight zone throughout the whole process. This means that these artifacts, in fact, are there, they could have probative value, but they are ignored by the police force who attends the crime scene. For example, the decision of what is photographed or the decision of what is relevant to be included in the report (Wyatt, 2014a) depends largely on the sociocultural understandings of the police force on the ground.

If giving visibility to the narrative of the crime scene through police reports and photos increases the legitimacy of the police work, the actions associated with the tacit knowledge (keeping invisible or in a twilight zone other aspects of the narrative) may weaken that work.

The *professional vision* (Goodwin, 1994), which has been adopted by different agents, may have consequences for the way knowledge is constructed and shared not only between different epistemic cultures (police, laboratory and court) but also between different “epistemic subcultures”, that is, different police forces attending the crime scene.

The tools used at a crime scene can impact investigators' work and the interpretative resources may themselves be "contaminants" of the evidence (Lynch *et al.*, 2008, 59).

Although the police are the legitimate actors attending a crime scene, their intervention can be conditioned by several factors: human and technical resources, ways that knowledge is mobilized (tacit or based on formal procedures), police legal framework and other legal provisions, as the legal system. All of these factors can contribute to changing the way the criminal investigator attends crime scenes and the way the narratives are constructed.

2. Criminal investigation in Portugal – some specificities

In the adversarial systems, as in the UK or USA, the disputing parties (the prosecution and defense) can present their versions of the facts. Being an occasion for a confrontation between the representatives of the state and the accused, in which the evidence is discussed and deconstructed in court, in terms of technical doubts, evidence weaknesses or even breakdowns in the chain of custody. In the inquisitorial legal systems, as is the case in Portugal (and most Western European countries), the judge is considered the expert of experts. Besides the crucial role of conducting the trial, he has to determine which pieces of evidence are admissible and judge them. Thus, the judge plays an active role as a "fact finder". The Public Prosecutor bears the burden of proof and, even though the defense may request counterproof, the latter as to be accepted by the judge, meaning that counterproof rarely is admitted in courts, favoring the idea that DNA is not contested (Machado and Costa, 2013).

The Law 49/2008 of 27 August (Organization and Investigation Criminal Law – LOIC) regulates the criminal investigation work in Portugal.

Portugal has three police forces: the Judiciary Police (PJ), the Security Police (PSP) and a military police force (GNR). The first is responsible for criminal investigation in the country, the second is a police force with a security character and a great presence in urban areas, and the third has a military role with intervention in rural areas.

This law establishes that the first step to be taken by the police after a crime is reported is to inform Public Prosecutor's Office. However, even before receiving orders from the judicial authority, police forces may proceed with the urgent measures required to secure evidence. As set out in Article 7 of LOIC, crimes involving homicide and sexual aggression are, in particular, the responsibility of the PJ.

This is the entity that manages the crime scene, assisted by the PSP or GNR, depending on which police force is in closest proximity⁴. GNR and PSP, in addition to conducting urgent acts to secure

evidence in crimes that are under the jurisdiction of the PJ, are also responsible for developing diligence in investigating crimes under their capability.

According to LOIC sexual crimes and homicides are two types of crimes under the jurisdiction of the PJ. Theft, robbery (without fire arms), kidnapping or moral physical offenses are crimes within the jurisdiction of the proximity police forces. This law also states that the collection of biological traces falls under the jurisdiction of the PJ, while the collection of fingerprints is the responsibility of the PSP and GNR. Thus, when addressing crimes under the jurisdiction of the PJ, proximity police forces should only take steps to enact the most necessary measures in order to preserve the crime scene.

What is established by law is based on the previous assumption that all police forces are capable of intervening efficiently at the crime scene, carrying out the initial investigation, preserving the crime scene and executing the initial protective measures in order to warrant the subsequent interventions are done correctly. Although, previous studies conducted in Portugal reveals the ambiguities of this law and the difficulties involved in applying it, in terms of clearly definition of responsibilities for the criminal investigation work and the lack of technical and scientific training for the PSP and GNR and of materials resources to enable these police forces to collect traces efficiently from the crime scenes (Machado and Costa, 2013; Costa, 2015; Costa 2014). These studies also reveal the existence of a proactive attitude on the part of the proximity police forces, even with respect to crimes that are not in their jurisdiction. This situation leads to the identification of a) different ways of knowing and different practices among different police forces that are present at the crime scene and have different resources (Costa, 2014, 2015; Costa and Machado, 2012; Machado and Silva, 2010). The practices used are strongly marked by the “evidential pragmatism” (Santos, 2014, 182; Costa, 2015) of the police’s activities. This pragmatism could lead to a discretionary and situational understanding grounded in their different sociocultural understandings (Costa, forthcoming) and with an impact on legal decisions.

Although Portugal had begun the scientification of its police work at the end of the twentieth century (later than in the adversarial systems), criminal investigation in the country has to deal with these particular circumstances, trying to balance the legal requirements, with the technological advance and the sociocultural understandings.

Different police forces make visible some forensic artifacts, devaluing others that could give rise to new potential forensic artifacts in the construction of robust evidence. If the chain of custody is apparently followed by different police forces with similar ways of documenting the collected evidence, then some specificities within their work can be highlighted when observing their practices.

3. (In)visibilities of the criminal investigation in Portugal

To do this research I asked for authorization by the Portuguese Prosecutor General Office that authorized and requested the Scientific Police Laboratory (LPC) to provide a list with all the cases in which there had been collection of biological traces. A list with 263 cases was provided from all the cases that entered LPC during 2002 and 2012, covering all the country, all types of crimes and all police forces. A sample of 20 cases was selected, considering the diversity of crimes, geographical diversity and different police forces attending the crime scene, and also time, resources constraints and the high non-response rate by many courts to give permission to the consultation of the legal proceedings chosen. The fact that the sample was constituted on the basis of the list provided by the LPC can bring some bias, since, in all analyzed cases biological traces were collected and delivered to the laboratory. In this sense, nothing is known about the cases where biological samples were not collected or for some reason did not arrive at the laboratories to be analyzed.

Nevertheless, taking in consideration the cases that were analyzed and the main conclusions based on the procedures used by the police, I believe that significant differences would not be found.

Twenty judicial proceedings were consulted: five typified as qualified theft, six simple theft; three robberies, one offense of physical integrity; one of child sexual abuse; one homicide in the attempted form; one rape and one kidnapping. The great majority are thefts. Half the cases reached the prosecution stage, but 45% of them were archived in the investigation stage, with the most serious crimes coming to the court. Those who came to trial in a large percentage (70%) there was a conviction, in 20% there was withdrawal of the complaint and 10% were archived.

If we look at the total set of proceedings 45% of the cases were archived in the investigation phase and 5% in the prosecution stage, which means that half of the processes were archived, not allowing to know what happened; 35% resulted in a conviction; 10% in the withdrawal of complaint and in 5% the case was still ongoing.

I highlight three cases that show different crimes, with different police forces attending the crime scene (under their capabilities, or not) and the different situations that arise to police forces and the different understandings and practices.

Based on a qualitative approach (Charmaz, 2006) I will try to answer the question: How are sociocultural understandings and the professional vision reflected in the production of forensic artifacts? All these cases have been examined in the post-doctoral research project “Trajectories of traces in crime scenes”, funded by the Portuguese Science and Technology Foundation (FCT, SFRH/BPD/63806/2009)⁵. The criteria used to select the excerpts was the one that allowed to highlight this point, leaving behind other aspects of the narratives not directly associated with the decisions related with the sociocultural understandings of the police forces in order to decide which will help justice.

As Knorr-Cetina (2016) states the narrative is constructed. Being constructed in a way means that it could have been constructed other different way. In these cases the narratives were constructed from the biological traces collected and seen. If other traces were seen (or searched), according to a different professional vision, the narratives constructed could have been different.

3.1.CASE 1: Attempted homicide

This case shows that, even in crimes within the PJ jurisdiction, the intervention of the proximity police can impact in the narrative constructed. It also shows that different sociocultural understandings from different epistemic subcultures turn visible different issues and show different ways of doing and seeing.

The knowledge that was produced and shared by different police forces (PSP and PJ) depends on their “selective professional vision”, which gives visibility or leaves hidden some artifacts according to the police’s reference frameworks and their degree of technological enthusiasm (Prainsack and Toom, 2013).

Using the photo reports, this case allows us to understand what each police force considers relevant at the crime scene and how tacit and formal knowledge are enacted according to the police force attending the crime scene (Costa, forthcoming). These reports also reveal their role as a way of giving legitimacy and credibility to the work done. While PSP seems to make the photo report of the crime scene to allow them to credibilize and document their work, the PJ seems to consider this work to be insufficient and moves toward a renewed diligence as a way of claiming the epistemic and occupational space for themselves and demarcating their work and the work done by “the others” (Wyatt, 2014a; Costa, forthcoming).

The technological enthusiasm demonstrated by the proximity police, driving their professional vision for the biological traces could have contributed for the final outcome.

3.1.1. The narrative

This is a 2005 case of the attempted murder of a 43-year-old woman that took place when she arrived home and was preparing to enter her garage at night. The suspect was her husband. He confessed to the authorities that he stabbed the victim. The PSP, the proximity police, attended the scene and removed the car to perform the inspection and then called the PJ, as the crime fell under their capabilities. The PSP described the locale, stating that several people were at the place and the vehicle was open and with blood traces (stains) in the front seats. The victim had already been transported to the hospital, and the police officer went there to hear her story. The victim declared that when she arrived home, her husband entered the car with an open knife in his hand and stabbed her in the face,

neck, arms, chest and back. She stated that while stabbing her, he said: "Since you are not for me, I'm going to kill you; I don't mind going to jail".

The collection of biological traces was done the next morning by a PJ officer in the PSP parking lot. The report had eight photos:

1- One swab containing supposedly hematic traces collected in the front door at the left side, outer side of the referred vehicle, according to photo number 4 of the photographic report; 2- One swab containing supposedly hematic traces collected in the upper part of the driver's seat (...); 3- One swab containing supposedly hematic traces collected on the front door handle on the right side (...); 4 - One swab containing supposedly hematic traces collected on the right front door trim (...); 5 - One swab containing supposedly hematic traces collected in the ladies suitcase on the front seat on the right side of the vehicle, as shown in photograph no 9 (...).

The fingerprinting report was also done the same morning by a PSP officer who mentioned that no dactyloscopic traces had been collected.

That same day, the PSP requested that the public prosecutor's office authorize a search and seizure at the suspect's house. Three PSP officers followed the order.

Inside the house, already inserted into the drum of the washing machine installed in the kitchen, I found a yellow shirt with traces of blood and a green coat with the same type of traces. In the wardrobe in the room, I found a pair of green trousers also with blood traces. In the garage of the property where he lives and inside the vehicle of his property, (...) with the registration XX-XX-XX⁶, brand Fiat, model Y and black in color, under the front seat, inside an existing drawer, I found a swiss army knife, probably used to perpetrate the injuries (...).

Nine pictures taken by the PSP were added to the judicial proceeding.

Photo 1: Knife used in stabbing; Photo 2: Shirt that suspect wore while stabbing with traces of blood on the left sleeve; Photo 3: More detailed photo of the right sleeve of the shirt, which the suspect wore at the stabbing and which has noticeable traces of blood; Photo 4: More detailed photo of the left sleeve of the shirt, which the suspect wore at the stabbing, with traces of blood on its wrist; Photo 5: Jacket that the suspect was wearing when he stabbed the victim; Photo 6: Left sleeve of the jacket that the suspect wore when stabbed the victim, with traces; Photo 7: Jacket pocket, left side, with traces of blood; Photo 8: Trousers that suspect supposedly wore when he stabbed the victim.

The public attorney required the imprisonment of the suspect.

In addition to this photo report of the traces collected at the suspect's house, the photo report created by the PSP of the victim's vehicle also added nine pictures to the judicial proceeding.

Photo 1 – Vehicle viewed from the front; Photo 2 – Vehicle viewed from behind; Photo 3: Passenger compartment, driver and passenger sides, with a bag and a knitted cardigan on the right seat and a pair of glasses and exterior reviewer mirror, left side on the drivers' seat; Photo 4 – Drivers' seat with blood traces; Photo 5 – Passenger seat, right side front, with several blood traces; Photo 6 – Window from the

front door right side, with blood traces, inner side; Photo 7 – front door, right side, inner side, with blood traces, next to the handle; Photo 8 – Front seat right side, and part of the panel, inner, with blood traces; Photo 9 – Victim’s bag, left on the front seat right side with blood traces.

The suspect made a statement.

Last night (...) he called her [the victim] around 8pm to meet her as they had agreed. At that time, his wife told him she was in X [other city], but the deponent didn’t believe her because he hadn’t heard the background noise of a city. He had dinner and drank too much. At 10pm he went and waited for her ... she didn’t appear. He waited until 10.40pm, and at that time, he decided to go and see if she was already at home (...). He saw her getting out of the car to open the garage door and (...) approached her and said that she had been with another [man]. She confirmed. (...) With that confirmation from his wife, he lost his mind and gave her some blows with his knife. He would not have done it if he had not been so disturbed by alcohol. He stopped, impressed with the blood. He didn’t want to kill her; he didn’t know what he wanted.

A buccal swab of the victim was made and sent to the LPC⁷ together with the suspect’s shirt and knife.

Twelve months after the event, the LPC sent a report referring to the existence of a match between the buccal swab taken from the victim and the stain in the defendant’s shirt. Concerning the knife, LPC states that “no results were obtained possibly due to the small sample size”. Carried out to the court the victim gave up the complaint. Even so, in the case of a public crime, according to the Portuguese law, the court proceeded with the prosecution. On trial, the victim, the witnesses and the defendant went silent and the case was dismissed for lack of evidence.

3.1.2. *Analysis of the case*

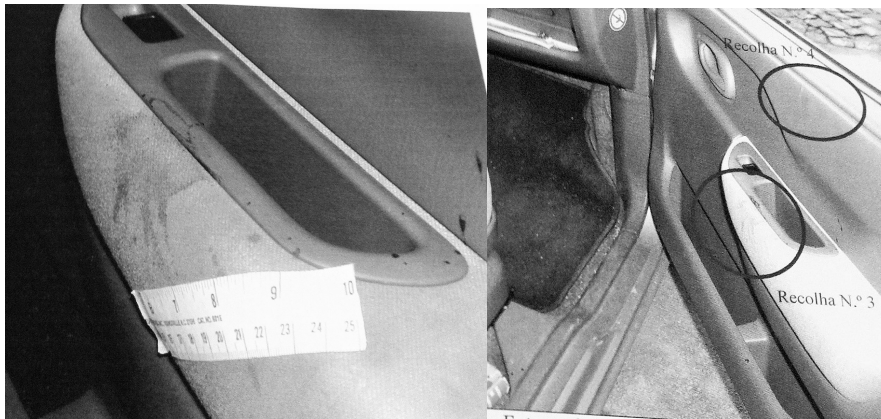
In the case of this crime within the jurisdiction of the PJ, it was the PSP who attended the crime scene about three hours later, as it is one of their tasks, according to LOIC. If the proximity police described the place, nothing was said about whether it was isolated except for the “existence of several people”.

The PSP described the place, but nothing was said regarding the preservation of the scene. Instead, the place where the crime occurred and the procedures followed by the police were all rendered invisible.

The report stated that the vehicle was transported to the PSP parking in order to preserve the traces. The understanding that “the natural border of a scene” (Wyatt, 2014a) was the car itself raises the issue of whether there seemed to be care in wanting to preserve the traces in the car at the cost of the PSP possibly neglecting the wider context (Costa, forthcoming). In addition to having giving invisibility to the locale in which the crime occurred (near the victim’s garage), which was not

photographed or inspected, nothing was said about the care taken in the car's transportation. Who transported the car? How it was transported? What measures were taken?

The inspection of the victim's car was conducted in the police garage. There were two photographic reports – one was generated by the PSP and the other was generated by the PJ.



The same objects were described in different ways, using different language, using different markers, revealing different sociocultural understandings of what seemed important to make visible. In the photographic report, the same item (the right door of the car) was described differently. While the PJ described it as “containing supposedly hematic traces”, the PSP described the same as “blood traces”. While the PJ made use of conditional language, the PSP assumed it was, in fact, a blood trace. While the PJ made a blue circle in the computer image to highlight the precise location where the stain was found, the PSP put a paper marker (with rule) in the door handle, just beside the stain's location. In addition to the two different ways of doing and seeing the “same”, the double intervention by two different authorities may have introduced contamination into the space.

When the PJ was called to the locale of the crime scene, they could no longer decide whether they wanted to do the inspection of the vehicle at the locale or whether the vehicle must be removed. By analyzing the vehicle in another place, the PJ may have had to deal with issues arising from the transportation from the crime scene and the investigations done by the proximity police. When the PSP did the photographic report and incorporated the scale markers into the vehicle, they may have introduced contamination, as nothing was known about the precautionary measures taken during this examination. When the PJ did their work, they had to articulate good practices and simultaneously manage the understandings done by the police who first arrived at the scene.

The next day, a search and seizure of the suspect's house was authorized by the Public Prosecutor.

Unlike the victim's car inspection, only the PSP investigated the house and the suspect's car. However, as with the work done in the inspection to the victim's car, the PSP continued using the same kind of language, describing the items founded as: "knife used in the stabbing"; "shirt that the suspect was wearing when stabbing", and so on. The suspect's belongings were photographed (trousers, shirt, knife) but not the space itself; the surrounding space was not considered. It made invisibility except for the washing machine where the clothes were found and to the car compartment where the knife was found. However, if visibility was given to the victim's vehicle, the suspect's vehicle was maintained in a twilight zone. In addition, no indications were given regarding where belongings were photographed (whether they were in the suspect's house or in the police office), what kind of precautions were taken in the collection of traces (e.g., with or without the use of gloves, stored together or separately, using different types of bags according to the nature of the traces), how they were transported from the suspect's house to the laboratory, or which trajectory was used. While the biological traces in the victim's car were collected by the PJ, the biological traces at the suspect's house were collected by the PSP. While the PJ has made a second photo report in the victim's car, no photo report is done in suspect's house by the PJ.

The photo report of the victim's vehicle appeared only in the PSP parking lot. The biological inspection report was also done at that time. By analyzing the photo reports done by different police entities (PSP and PJ), differences can be identified in terms of procedure and which matters to make visible.

Aside from identifying the swabs collected and duly documented with pictures, the report on the collection of biological traces conducted by the PJ on the victim's vehicle also had a description that used conditional language (Wyatt, 2014a). In the photo itself, there was a blue circle to identify the precise zone from which a stain was extracted. However, while the PJ used conditional language ("supposedly hematic traces", for instance) to describe the same objects, the PSP assumed that those objects were, in fact, blood traces: "driver's seat with blood traces" or "victim's bag, left on the front seat right side, with blood traces".

Additionally, if the PSP was careful to note areas of potential for the investigation, they used markers (with a rule and self-adhesive papers) apparently with the desire of revealing and giving visibility to those critical zones. However, the PSP accomplished this in a different way from the PJ, who chose to mark these same zones in the computer (with a blue circle on the zone that mattered) in order to avoid contamination.

There was no photo report of the search and seizure at the defendant's house. Thus, if visibility was given to the victim's vehicle, then the suspect's vehicle and his house – where objects with probative value were found – were maintained in the twilight. In particular, they ignored his vehicle,

which could have marks of tampering with the victim's vehicle and the knife, which was found in the car's glove compartment. Total invisibility was given to the plate of the two vehicles by police entities without any mention or information that indicated that some diligence was made in terms of investigating this information, which could provide additional evidence of the facts.

As a case with several biological traces, there was no room for the collection of fingerprints. In fact, at no time did fingerprints appear to have been considered either in the victim's vehicle inspection or in the suspect's knife inspection, for instance.

Finally, concerning to the victim's buccal swab, although in this case it was not the police who made it but the Legal Medical Office, her consent was not documented in the process, nor was the swab itself. Nothing is said about where and when the buccal swab was collected.

Although this case was carried to court and had documentary and testimonial evidence and the confession, the biological evidence closed the case. The victim's and witness's silence at the trial together with a crucial biological trace – the knife – revealed “the small sample size” that may have contributed for the final outcome.

3.2. CASE 2: Theft case of a coffee shop⁸

This case demonstrates that the police sociocultural understandings could drive the narrative for a certain direction. Starting with a prior understanding, the traces are selected in order to achieve the evidence that fits with that narrative. It shows also how suspects could gain or lose visibility according to the reference framework adopted.

3.2.1. The narrative

In May 2003, a theft at a coffee shop occurred between 3.30 and 6.30am. The complaint was made at 9am to the GNR. Two officers wrote the following in their report:

(...) It was verified that there were in fact several signs of break-in, the filchers having introduced themselves by the roof (see photo no. 1), removed a half pane of cement and broken the other half to provide enough width at the entrance for a person of lean stature.

After entering in the commercial space, they rummaged in the cash register, which had nothing, opened the cigarette machine and removed all the packs and money (see photo n° 2, 5). (...)

They also violated the flippers machine mechanism, withdrawing all the money (see photo no. 6).

They also stole a big TV (...) (see photo no 5) that was above the cigarette machine.

That's why it is believed that there was more than one filcher as well as a vehicle according to the TV dimensions.

Certain objects and blood traces were also detected, and we requested the presence of our technical team NAT (Group of Technical Support), which immediately went to the locale, collected traces, and also proceeded to inspect several zones that were in contact with the criminals in order to collect fingerprints. However, the effort was fruitless, as they were believed to be using gloves (...).

Two days later, the GNR received an anonymous phone call accusing the former owner's son, Tomé.

(...) I asked him if he had seen the robbery. The anonymous person answered by laughing at my remark and informing me that a person does not see what he does want to see to (...) I also asked him if [the objects] could be at the ex-owner's house, and he answered loud and clear: "Bingo!"

After the phone call, the GNR requested authorization from the public attorney to conduct a home search.

Three weeks later, the former owner - Eva was heard saying that: "(...) on the night the theft occurred, she heard João commenting that three individuals were coming, each one with his black bag on his back (...)"

At the end of January 2004, the LPC sent their report.

- I. A swab, stained at the end in a grayish yellow tone.
- II. A piece of paper on which a brownish-red stain was detected and presented, among other references, "totoloto 0/00" (...).

From the analysis of these two traces, the LPC concluded that in swab I, "blood traces were detected" and in the piece of paper (II), "human blood was also detected". They ended by saying that "the analysis will be made if a buccal swab of the suspect(s) is sent".

In November 2004, the public attorney requested that the GNR listen to Ana. She said:

(...) she left the disco "Queen" in Ovar together with three boys, ALBERTO, LUIS and another one she claimed was FRANCISCO (...) living on the same road as Alberto (...) These three friends left her at home (...) she doesn't know where they went afterwards.

On the same day, and based on Ana's testimony, the public prosecutor requested that Alberto, Luis and Tomé be presented to the PJ to take a buccal swab. Luís attended on the appointed day. A new date was assigned to the others, but only Tomé was present. The PSP informed the public prosecutor that Alberto was out of the country. The prosecutor then requested that the GNR try to locate him, and some days later, the PSP informed them that he was identified in France, presenting his actual address. Nevertheless, the police sent to the laboratory the two buccal swabs to be compared with the two traces found at the crime scene.

In June 2005, the LPC sent its report, concluding:

(...) there are no identity of polymorphisms (...) from the biological traces present on the cigarette butt (...) or the buccal swabs collected from Alberto and Luis, and they should therefore be EXCLUDED as donors of those traces.

- In the DNA analysis of the biological traces present on the cigarette butt (...) a profile from a male was obtained.

Taking in consideration the evidence collected the case was dismissed by the Public Prosecutor under the investigation and did not reach the court for a charge.

3.2.2. *Analysis of the case*

The theft must have occurred during the night; the complaint was made by 9am, and by 10am, the GNR conducted their inspection. Despite the existing signs of a break-in that included a door damaged, an entrance by the roof, a cash register ransacked, a cigarette machine opened, and a *flippers* machine violated, the lofoscopic inspection that was conducted was negative. However, in this case, the lofoscopic inspection was performed, and the police mentioned that the perpetrator(s) could have made use of gloves (which did not occur in the previous case).

In this case, an accurate photo report also existed depicting the several objects handled and a picture of the lotto bulletin sent to analysis. However, nothing is known about the locale where this bulletin was found. Concerning the cigarette butt sent to the laboratory, it was not photographed, or at least, it was absent from the report. The lofoscopic inspection report states that “[N]o traces of identifying value were collected” and that “the biological traces supposedly hematic (blood) were sent that day to the LPC (...)” It does not mention either which biological traces have been collected. Nothing is known about this cigarette butt. Reading the process, only when I arrived at the report of the LPC I’ve been confronted with the presence of a cigarette butt and the lotto bulletin. GNR collected two samples and sent them to the laboratory not describing them. GNR collected two samples and sent them to the laboratory even having nothing to compare. This situation leads the LPC to inform that “the analysis will be made if a buccal swab of the suspect is sent”.

If it was present the negative lofoscopic inspection report, it was absent in the biological inspection report, the reason why we only realized the existence of the cigarette butt when the LPC sent the report. In this sense, nothing is known about when the traces were collected, by whom, and with which precautions. Once again, the cigarette butt is in a twilight zone, since although with probative value it does not gain procedural existence in the police report.

It must be highlighted that the police assumed that were in the presence of more than one individual, considering the TV dimensions. Tomé was the previous suspect, according to the anonymous phone call. Her mother – Eva, was associated at the phone call as his accomplice. Later, Ana’s testimony gave consistency to the possibility of more than one suspect referring to three suspects: Alberto, Luis and Francisco. Tomé and his mother, and the three new suspects identified by Ana (and Ana herself) police could be in the presence of six suspects. Ana was formally listened, Tomé’s mother

was listened as witness but the search to her house, requested by the police, was not made. Surprisingly, Tomé, Alberto and Luis were asked to collect a buccal swab. Francisco – the other man identified by Ana and, Eva or even Ana disappeared from the list of the suspects to whom buccal swab must be done. In fact, the buccal swabs were requested only to three suspects: Tomé, Alberto and Luís.

A buccal swab was made to Tomé and Luís and no match was identified with the biological traces collected by the police. Alberto was identified in France. An effort was made to locate this suspect and when this was achieved, the police choice was that it would not be necessary to go and meet him, or ask the French authorities to collect a buccal swab from the suspect, or even waiting for his return to the country to collect the buccal swab. Consequently, the buccal swab to Alberto was not made. Even the absence of a match between Tomé and Luís with the biological traces led the police to insist in the search of Alberto and the collection of a buccal swab. Even Ana's testimony have made mention to another person – Francisco, the police did not tried to identify him.

In this sense, it seems that the understanding of GNR is that what matters is to collect biological traces and the laboratory and DNA will set the rest, forgetting that without something to compare technology (and DNA, in particular) will not help.

The fact that there were two identified suspects, to whom buccal swabs were collected seems to have reassured the police that based on these two buccal swabs the case would be solved, neglecting other evidence as the home search or the identification of other potential suspects. The reasons that led the police to follow this clue and leave it in a twilight zone are also invisible in the reports.

3.3. Case 3: Theft of jewelry

The relevance of this case lies in the way it shows how the professional vision of police forces is directed for the search of biological evidence, which could lead to a weak narrative, instead of complementing the biological evidence with other evidence that, if carefully considered, could allow a strong evidence in the aid of justice, not avoiding that subjective factors intervene in the construction of the narrative.

3.3.1. The narrative

In February 2003, there was a theft of jewelry with three male suspects.

The complaint was made at 4 am, and the report stated:

At the locale, I checked that “Diamond” Jewelry had its protection grille forcibly lifted, the window glass broken (...) and the exhibitor was jumbled. (...) the police were informed by witnesses that moments before, three males between 20 and 30 years, hooded and using hammers, assaulted the shop, getting away in a black colored vehicle, with the registration 00-00-ZZ.

The inspection report referred to the existence of “handling surfaces, external grilles and exhibitors”.

Two days later, the PSP sent a request to the LPC asking for a DNA analysis from the collection of supposedly hematic traces using a swab with a trace collected in a plastic exhibitor (...) that was inside the showcase.

Three months after the event, the victim was interviewed:

Immediately, he went to the locale where the police were already, found that the grille was raised about 20 centimeters and the window glass broken (...).

He realized that the transgressor did not want the shop, but merely tilted a movable exhibitor stand there, dropping the articles in it (...).

What he knows about the assaulters is that they were three hooded individuals who were in a dark colored vehicle, seen by a neighbor (...).

One week later, the police officer who was at the crime scene made a statement:

According to the information given by the central radio, the assault was perpetrated by three hooded male individuals (...) who were in a dark colored vehicle, registration 00-00-ZZ, according to information given by an eyewitness, who at the time of the event was not able to identify the perpetrators and preferred anonymity.

An informatic search was performed on vehicles with registration that started with the pair ZZ and ended with 00, and 19 vehicles with those characteristics were identified over several models, brands and different geographic locations, which is why it is impossible for this brigade to determine which vehicle was involved in the assault.

In July, the LPC sent the report stating that in the sample “blood traces were detected” and the DNA analysis “could be done if a buccal swab of the suspect(s) was sent”.

In the beginning of the next year, crossing this case with other cases with similar *modus operandi*, the police identified seven Romanian suspects: five male and two female. The PSP sent five buccal swabs to the LPC. The swabs had been collected from five of the seven suspects of Romanian nationality, indicating that they were “accompanied by the respective Declaration of Authorization for the collecting for identification of blood traces collected in the inspections related to the jewelries (...)”.

In November, the LPC sent its report with no polymorphisms matching the hematic traces detected on the swab collected at “Diamond” jewelry to the buccal swabs of the five suspects. However, a male profile was detected.

Pictures of the buccal swabs taken from the suspects were attached to the report as well as the informed consents, dated and signed.

None of the five suspects did match with the trace collected in the exhibitor and the case was closed in the investigation stage.

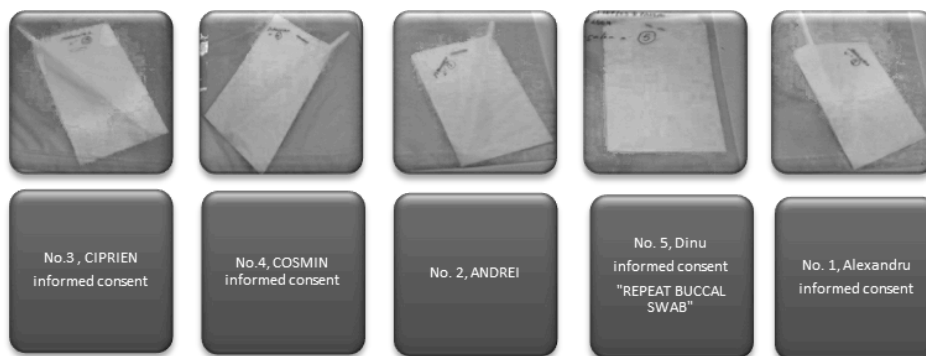
3.3.2. Analysis of the case

The lofoscopic inspection highlights the existence of “handled surfaces: exterior grilles and exhibitors”. In addition, the biological traces report states that the police collected “01 swab with a supposedly hematic trace from a plastic exhibitor of earrings, which were inside the broken showcase”.

In the PSP narrative, nothing was said about the way the first officer proceeded in the locale, and he was cautious not to damage any traces with potential identifying value. The fact that nothing was said could indicate that it was not seen as relevant to have other entities assess whether the performance was well or poorly conducted. Since only biological traces were collected, we can conclude that in this case, the PSP only had the option to collect the supposedly hematic trace, devaluing other potential traces with identifying value (such as fingerprints or the car’s registration) and other elements collected at the crime scene, such as the eyewitness information.

Although the judiciary team has been to the locale, nothing has been said about the way they performed. There was no room for either a photo report at the crime scene or for the collection of traces themselves.

Once again, proximity police – in this case, PSP – sent to the laboratory the trace collected, but with nothing to compare, as occurred in case 2.



The PSP report noted that five swabs with the corresponding consent were sent. This information was imprecise, since one of the consents was missing. Andrei’s consent was not included, and the reasons for that absence was not indicated – whether he consented or not or whether the consent was lost.

Although there is an eyewitness who identified some suspects, she would have preferred anonymity and it probably constituted an accepted request by the police force and which will have led the police not to search for them at a first stage. Only when crossing this case with other cases with

similar *modus operandi* the police identified seven Romanian suspects. If the information provided by the anonymous eyewitness was discarded at a first moment, later, when co-relating it with other similar cases, the police uses the eyewitness information to conclude that they were in the presence of five suspect males (according to the eyewitness description), getting out of suspicion the two Romanian females. The reason why just the five male suspects were submitted to the collection of a buccal swab, probably rests on the ladies' statement of being three individuals. But, as said in the report, they were hooded, which could turn difficult to say with certainty if they were, in fact, male or female. This previous assumption could have determined the trajectory of the narrative, leaving in a twilight zone the two female suspects.

Although this case had the advantage of crossing three events trying to find the authors of several crimes perpetrated in the same area, the suspicion lies with the Romanian group. Using the personal collective and shared knowledge arising from the association of several cases with identical *modus operandi*, the investigation can be facilitated and reach out to suspects more easily. This makes certain people more suspicious than others (Kruse, 2016). In this case, Romanian more suspicious than others, men more suspicious than women.

In fact, the LPC report discarded the female suspicion. Even not being done the buccal swab to the female suspects, the analysis revealed a male profile detected. In any case, by following the right clue of being a male suspect the police did not achieved the identity of the author.

Conclusion

The analysis of these three cases reveals that forensic artifacts produced in criminal investigations in Portugal rest largely on the way that contextual artifacts, sociocultural understandings and the "selective professional vision" are mobilized by different "epistemic subcultures" to produce knowledge.

To the PJ, the contextual artifacts may offer coherence, credibility and legitimacy to forensic artifacts collected at the crime scene; to the proximity police, forensic artifacts seems to allow contextual artifacts to gain credibility.

Without a methodical and structured way of working, the cases are evaluated in a discretionary way, with some information highlighted and some turned invisible and kept in a twilight zone. The production of forensic artifacts in the proximity police context seems to rest on the fulfillment of contextual artifacts such as notice report, entrance hour, exit hour, signature, etc., that do not seem care whether the elements fit together and are meticulously articulated with the discovered forensic artifacts.

Biological traces seem to be chosen by police forces at crime scenes. Despite current knowledge that criminals avoid leaving evidence of their passage, namely, by using gloves (Machado and

Prainsack, 2013), there were cases in which this did not occur (case 1). However, the proximity police opted to give invisibility to fingerprint collection, which could have helped the investigation through its association with the production of other artifacts.

The police have different ways of producing photo reports; they have different ways of describing the same objects, and the description (or lack of description) of these same objects reveals different understandings and different cultures of action. Finally, concerning the value of buccal swabs and the need for consent in the cases analyzed here, it was possible to understand that a discretionary use of swabs is occurring. Swabs are taken from the victim (case 1), from the suspect (case 3), or they are collected in legal medicine offices (case 1) by the PJ (case 3), or in other cases (not analyzed here) by the proximity police themselves (Costa, forthcoming).

In this sense, it seems plausible to conclude that in the same way that epistemic cultures of the criminal justice system (Knorr-Cetina, 1999) have different understandings of what is valid knowledge and how that knowledge must be produced (Kruse, 2016), different police “epistemic subcultures” also have different understandings of what is valid knowledge and how it must be achieved. If all police forces try to highlight forensic artifacts that will assist the justice system, then the organizational elements, the sociocultural understandings and the “selective professional vision” mobilized by different police forces can uncover the contextual elements that create scientific evidence rather than scientific evidence itself.

Therefore, if the narrative must be constructed and then grounded on the traces collected at the crime scene, it seems that in the Portuguese context, the proximity police vision is directed to see biological traces which will (supposedly) allow to give coherence to their narratives

Therefore, the police forces construct their narratives through the (biological) traces that they find at a crime scene and are these same narratives based on their selective professional vision that allows to construct the evidence.

Taking DNA as the *triumphant hero* (Prainsack and Toom, 2013) in the conjunction of forensic and contextual artifacts may prove to be of no value to justice.

The belief in DNA’s potential, the degree of technological enthusiasm that police forces assign to this technology in Portugal can determine the value that forensics science has to aiding justice and may ultimately render it into an *apparent* credibility (Wyatt, 2014a) without the desired effects on justice, without Public Prosecutor or Judge questioning the practices reinforcing the idea that DNA is not contested by any epistemic culture of the Portuguese criminal investigation panorama.

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Notes

¹ This term was coined by Foucault and refers to the set of relation strategies or forces that support or are supported by

² See van den Eeden *et al.* (2016, 476) where they explore the effect of prior information. “[o]bjects may be interpretable on more than one way, depending on the exploration adopted of what happened”.

³ Goodwin uses the term “professional vision” (1994).

⁴ This issue is not exclusive to Portugal. In other countries, the closest police forces first attend at the crime scene. See Kruse, 2016, about the Swedish case. See also Costa, 2015, comparing Portugal and the UK.

⁵ The present paper is the result of support from the Portuguese Science and Technology Foundation under the Strategic Project (UID/SOC/50012/2013)

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⁶ All elements in this paper that could identify the actors have been changed to fictitious names, locals and numbers in order to preserve the anonymity and confidentiality of the cases studied.

⁷ Although police forces in their narratives make use of different terminology (break-in, robbery, and so on) the case was typified as a theft.

References

- Charmaz, Kathy. 2006. *Constructing grounded theory: A practical guide through qualitative analysis*. Thousand Oaks, CA: SAGE Publications.
- Costa, Susana. (forthcoming), “O aparato forense e os entendimentos socioculturais na investigação criminal em Portugal”. In *Genética e Cidadania*, edited by Helena Machado, Edições Afrontamento.

Costa, Susana. 2015. “O tempo que passa é a ciência que foge: a cena do crime numa perspetiva comparativa da atuação das polícias em Portugal e no Reino Unido”. In *Ciência, Identificação e Tecnologias de Governo*, edited by Claudia Fonseca and Helena Machado, CEGOV: 195-220.

Costa, Susana. 2014. “Os constrangimentos práticos da investigação criminal em Portugal e suas repercussões na aplicabilidade da Base de Dados de ADN”. In *Base de Dados genéticos Forenses. Tecnologias de Controlo e Ordem Social*, edited by Helena Machado and Helena Moniz: Coimbra Editora: 229-267.

Daston, Lorraine and Galison, Peter. 2007. *Objectivity*, New York: Zone Books.

Foucault, Michel. 1979. *Discipline and Punish: The Birth of the Prison*. New York: Random House.

Goodwin, Charles. 1994. Professional vision. *American Anthropologist* 96: 606–633. doi: 10.1525/aa.1994.96.3.02a00100.

Jasanoff, Sheila. 2006. “Just evidence: The limits of science in the legal process”, *Journal of Law, Medicine & Ethics*, 34(2): 328-341. doi: 10.1111/j.1748-720X.2006.00038.

Knorr-Cetina, Karin. 1999. *Epistemic Cultures: How the Sciences Make Knowledge*, Cambridge, MA: Harvard University Press.

Kruse, Corinna. 2016. *The Social Life of Forensic Evidence*: University of California Press.

Kruse, Corinna. 2012. “Legal Storytelling in pre-trial investigations: arguing for a wider perspective on forensic evidence”, *New Genetics and Society*, vol. 31, no. 3: 299-309. doi: <http://dx.doi.org/10.1080/14636778.2012.687084>.

Kruse, Corinna. 2010. “Forensic Evidence: Materializing Bodies, Materializing Crimes”, *European Journal of Women’s Studies*, November, 17: 363-377. doi: <https://doi.org/10.1177/1350506810377699>.

Latour, Bruno. 1987. *Science in Action*. Cambridge, MA: Harvard University Press.

Lawless, Christopher James. 2011. “Policing markets: the contested shaping of neo-liberal forensic science”. *British Journal of Criminology*, 51 (4): 671–689. doi: <https://doi.org/10.1093/bjc/azr025>

Law 49/2008 of 27th August, Diário da República, 1st serie, no. 165, electronic version: http://www.dgpj.mj.pt/sections/noticias/lei-49-2008-de-27de/downloadFile/file/LEI_49.2008.pdf?nocache=1219829003.99 [page consulted on 1st of february 2017].

- Lynch, Michael, Cole, Simon, McNally, Ruth and Jordan, Kathleen. 2008. *Truth Machine. The Contentious History of DNA Fingerprinting*, Chicago/London: University of Chicago Press.
- Machado, Helena and Costa, Susana, 2013. "Biolegality, the Forensic Imaginary, and Criminal Investigation", *RCCS Annual Review*, issue no. 5, october, 84-105. DOI: 10.4000/rccsar.490.
- Machado, Helena and Prainsack, Barbara. 2013. *Tracing technologies: Prisoners' views in the era of CSI*. Farnham: Ashgate.
- Machado, Helena and Silva, Susana. 2010. "Portuguese forensic DNA database: Political enthusiasm, public trust and probable issues in future practice". In *Genetic Suspects: Global Governance of forensic DNA profiling and databasing* edited by Richard Hindmarsh and Barbara Prainsack, Cambridge. Cambridge University Press: 218-239.
- Porter, Theodore. 1996. *Trust in numbers: The pursuit of Objectivity in Science and Public Life*, Princeton: Princeton University Press.
- Prainsack, Barbara and Toom, Victor. 2013. "Performing Union: The Prüm Decision and the European Dream", *Studies in History and Philosophy of Biological and Biomedical Sciences* 44: 71 – 79. doi: <https://doi.org/10.1016/j.shpsc.2012.09.009>.
- Santos, Filipe. 2014. "Making sense of the story – the dialogues between the police and forensic laboratories in the construction of DNA evidence", *New Genetics and Society*, 33, 2: 181-203. doi: 10.1080/14636778.2014.916186.
- Star, Susan Leigh and Strauss, Anselm. 1999. "Layers of silence, arenas of voice: The ecology of visible and invisible work". Computer-Supported Cooperative Work (CSCW): *The Journal of Collaborative Computing*, Volume 8, Issue 1–2, March: pp 9–30
- Toom, Victor. 2012. "Forensic DNA databases in England and the Netherlands: governance, structure and performance compared", *New Genetics and Society*, vol. 31, no. 3, September: 311-322. doi: 10.1080/14636778.2012.687133.
- Williams, Robin and Johnson, Paul. 2008. *Genetic Policing. The Use of DNA in Criminal Investigations*, Devon: Willan Publishing.
- Wyatt, David. 2014a. *Accomplishing Technical and Investigative Expertise in Everyday Crime Scene Investigation*, Phd thesis, University of Exeter.
- Wyatt, David. 2014b. Practising crime scene investigation: trace and contamination in routine work, *Policing and Society*, 24:4: 443-458. doi: 10.1080/10439463.2013.868460.