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Restraining a monster: production of representations in an impure field

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Abstract: This paper analyzes the topic of representation from the point of view of ethno methodology and sociology of the scientific knowledge. It starts out by discussing the "standard image of representation" and the constructivist proposition of such an image. Then, a case of study is presented to suggest how collecting and analyzing practices of forensic evidence in criminal law, can contribute to understand representational adequacy. The aim of this paper is to lead to think differently of the representation considering how it is produced, managed and deconstructed. From this point of view, the proposition is to consider the representation not only as a problematic epistemological concept but also as a practical accomplishment in specific epistemic cultures.
Key words: representation, representational chains, legal evidence, forensic practice, DNA profiling.
Resumen: En este documento se aborda el tema de la representación desde la perspectiva etnometodológica y desde la sociología del conocimiento científico. En un primer punto, se discute la imagen estándar de la representación y la propuesta constructivista de dicha imagen. Después se presenta un estudio de caso en el que se sugiere cómo las prácticas de recolección y análisis de la evidencia forense pueden contribuir al entendimiento de la adecuación representativa. El objeto de este trabajo apunta a pensar de modo distinto la representación, considerando cómo ésta es producida, manejada y deconstruida. Desde esta visión, la propuesta consiste en pensar a la representación no sólo como un concepto epistemológico problemático, sino también como una realización de culturas epistémicas específicas.
Palabras clave: representación, cadena de representaciones, evidencia legal, práctica forense, perfiles de ADN.

Introduction[1]

This paper is the result of a research in etnomethodology and sociology of the scientific knowledge. The etnomethodology is a sociological approach to quotidian practices; it also studies every day practices in the professions and sciences. The sociology of scientific knowledge tries to approach the current methods and scientific facts as social fulfillments/accomplishments. Both approaches research philosophy of the science's familiar topics, but they do it in an empirical different way. Instead of trying observation, representation, measurement, discovery, theory, method or evidence as cognitive abstractions or normative forms, they make an effort to examine the historical and situated activities of observation, representation, measurement, discovery, theorization, accomplishment of methodological protocols and evidence interpretation. These topics frequently appear in epistemological arguments, and the scientists discuss them in their practices with diverse formality degrees. As a matter of fact, the scientists put these topics into practice. Observing, representing, measuring, etc. are highly specialized activities in the science, but they also take place in a wide range of professional and non-professional practices. Hence, for instance, the practice of criminology involves the discovery, the test, the argumentation, the proof, the fact and the evidence. The legal evidence, the fact, the discovery are not identical to evidence, fact and scientific discovery, but —as we will discuss in this paper— there are interesting connections between them.

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In this paper we follow a research procedure to deal with classical topics of the epistemology as situated social practices (Garfinkel, 1991; Lynch, 1993). According to this procedure, the first step is to select a familiar topic of the epistemology, such as the one of "representation". The next step is to identify what Harold Garfinkel calls a "perspicuous stage" (Garfinkel y Wieder, 1992: 184). A perspicuous stage is a practical situation where a theoretical familiar or philosophical topic becomes the name for an every day task, a problem or a subject on a worldly stage.

When we study a perspicuous stage, the members of a local community, where the practice is carried out, become our tutors. They teach us how to think of the topic related to specific and worldly circumstances. They do not instruct us in philosophy, but the derived teachings from the ethnography of a perspicuous stage can contribute to the academic debates related to the topic. The center of the research of perspicuous stage is to show how the current behavior on a world's stage lights this very topic. Such a research is more than a matter of finding good illustrations for general concepts. It can lead us to reexamine the established concepts and to reestablish the distinctions and debates associated with them.

When we focus on the "representation" topic in the paper, we start discussing a standard image of the representation and a set of contemporary argumentations on this image. Later on, we suggest how the recollection and analysis practices of the forensic evidence in criminal law can light the ways in which representational adequacy is produced, managed and deconstructed. Our objective will be to suggest a way to think differently of the "representation", not only as a troublesome epistemological concept, but also as an accomplishment of the specific epistemic cultures.

The standard image of the representation

Representation subject is part of a coherent image of the scientific activity.[2] This image has developed in the previous centuries and nowadays it remains with us. Inserted in this image there is a conception of the scientific activities as rational means to produce and certificate public knowledge. For Karl Popper (1970), representation is a crucial part of what he called "the social aspect of the scientific knowledge". The "social aspect" has to do with the way in which replications to observations and measurements are done, by means of results communication and the alignment of the practices in a community of scientists. The establishment of the scientific knowledge is a social accomplishment, for an isolated individual's confidence in an observation or measurement does no offer guaranty to the possibility that others falsify it. A lot of philosophers, historians and sociologists, including the very same Popper, have turned into trouble one or another aspect of this image, but it continues framing debates on the construction and replication of scientific facts. H. M. Collins (1985), for instance, uses Popper's replication in order to carry out critical empirical examinations of a number of contemporary cases. Even though Collins is not a Popper follower, the author's initial interpretation of the replication problem is in debt with Popper's representation image. For this author, as well as for many others who did not follow that particular line of philosophy, the social aspect of the scientific method includes formal communication and activity reproduction. Thus, for instance, a naturalist enters in the field, observes a new sort of plant, he describes and sketches its characteristics in a notebook, gathers specimens and then brings them as evidence into a museum or a laboratory. Later on, some others read the descriptions, examine the sketches,

[2] Steve Woolgar (1988) talks about an "ideology of the representation" and Andrew Pickering (1995: 5) uses the expression "representational language" to describe a metaphysical preoccupation related to the correspondence between knowledge and its objects. We use the "image" term, following Wittgenstein (1958: §115) to denote a legality that supports the "captive" scholars. This is more influential than a model or a theory, and kuhnian differently, it is not a legality of a specific scientific discipline.

analyze the specimens, and maybe they send their own expeditions to the field. Finally, the new discovery endures the criticisms or collapses the observations and contrary argumentations' weight. This image is complicated because of the mathematics role, and because of the importance of the observation and communication technologies in the modern science, and it still being the central argument in the philosophy of the science. However, it has an impressive resistance.

There are a lot of different debate lines on the science representation, but a familiar and persistent debate takes place among the proposers of the empirical and constructivist stances. The empirics pay primary attention to the observations of an independent world, which provides the support for what the scientists represent; this stance is concisely summarized by Peter Kosso (1992: 108):

> The observations are world impositions, they are inter-subjective and public in contrast to the beliefs and theories. They are accessible to anyone and, the hope continues being available for everyone […] When all the rest fails, in other words, any kind of persuasion is unconcluded, but at least we all can agree on the observations. They are the end of the dispute.

Note this stance is not incompatible with a "social" vision of the scientific activity. On the contrary, the empiricism provides a particular way to consider the inter-subjective status of the scientific knowledge. Let us examine the different aspects of the observation that Kosso attributes to the empiricism: 1. Imposition from the world. The world "imposition" can imply an unwanted gift or a task we are forced to accept. We can also imagine an unwanted guest who gets imposed our hospitality. This notion of imposition implies that a dominating world forces itself and unexpectedly before the scientists. Consequently, particular facts that the scientists did not expect or did not want to see make them modify their theories. 2. Inter-subjective and public. The observations (or, better, the reports which the describe the observations and instruct others on the way we made them) are shared by the subjects; they are public not private, they do not depend on the individual desires they are not will or individual luxury projections;

they are rather represented by the world to those who are willing to look with open eyes. 3. In contrast to beliefs and theories. Beliefs and theories can be publicly accepted, and they are expressed by means of the language, diagrams, mathematical symbols, but not necessarily refer to discreet objective sources, sensuously (or instrumentally) accessible. Differently from theories and beliefs, observations have independent and extra-linguistic reference points. 4. Accessible to anyone. At first, anyone can verify a valid report of an observation or an experience. The observations do not only require special virtues, dark frames of belief or hidden sensibilities. They only need normal perceptive capabilities, maybe helped by specialized instructions and instrumentation. 5. Available to anyone. The observations are not a product of persuasion. Instead, what scientists observe is an independent base to persuade other about the facts and natural laws. The observations supply the source or the agreement ground, more than a docile consequence from a persuasion mass. Not only are they the knowledge's start point —self-imposing upon us—: "they are end of the dispute".

This observation's conception stresses the importance and credibility of a report that faithfully represents an experience and allows other to reproduce it: "An observation's acceptable report is that in which the justification in terms of a consideration of self conditions and procedures can be given. In the science an observation cannot be evidence unless it can be justified in that way" (Kosso, ibid.). In other words, spoken reports and protocols instruct that anyone can use in order to reproduce the observation. We can add that the images of an observed object can be used as approaches to perceptive experiences so that other can use them as guidance for their own perception.

Taken as a whole, observation and report make up a communicative circle through which the experience of the individual perception is reproduced and validated, as part of a public knowledge fund. An initial observation is described in a public language or transcribed in images, later other can use those descriptions and transcriptions as instructions to reproduce and validate the original experience. Publicly verified knowledge is accumulated as a result of this social process of scientific observation. Popper's falsacionist program offers a sophisticated version of this social

process. Opposed to the verificationism, Popper (1963) arguments that the hypotheses cannot be verified beyond all doubt, for the public confidence believes in them they resist repeated empirical attempts to refute them.

Scientific instruments as the microscope, telescope, vacuum pump or particle accelerator complicate history, but they can be incorporated into the standard representation image. As it is frequently said, instruments normally extend perception: the instrument register data, and the scientists (or groups of scientists) examine those data in reference to competent hypotheses. The instruments mediate the observation perceptive relations, but the image of the representation remains in its place: the task for the scientific community is to demonstrate the correlation between the observation's report and the observed subject.

Drawings as well as descriptions can be incorporated to the representation's standard image. Galileo's lunar surface and Jupiter satellites diagrams are well-known examples. In autumn 1609, Galileo used a new telescope he had invented to stare at the more obvious objects in the night's sky. Why did he stare at Jupiter? According to Richard Westfall (1985), it was because of no particular reason. Jupiter happened to be there, brightly scintillating in the night's sky. Then Galileo realized that three of the stars were very close to that planet, and then after a several-day observation period traced their movements. Later on, he found a fourth "star". Galileo also examined earth's moon and sketched what he saw. Samuel Edgerton's research (1991) suggests that for the moon illustrations in *Sidereus Nuncios*, Galileo used the chiaroscuro technique, and that this technique to draw light and shadow allowed him to persuade his readers to see the moon as a tridimensional surface rather than a disc "spot". Even though the illusionist technique can contribute Galileo's perceptive experience, this does not contradict the representation's standard image, since the illusionist technique, it can be said, evokes the impression of a tridimensional surface with craters, which is more correct than the impression of a spot with plain surface. Galileo's reports created an immediate sensation, and months later, he fervently worked to keep pace with the orders of his telescopes; he also experienced difficulties when he tried to persuade others to see by themselves and understand the importance of his discoveries, but the representation's

standard vision seems to be correct because of the fact that, almost for centuries later, we can use Galileo's drawings (altogether with a telescope or even a pair of binoculars 10 times more powerful) as base to recognize the craters on the earth's moon and the Jupiter's moon.

Deeper complications appear when distortion sources in the observation are taken into account. As Kosso (1992:113) denotes:

> […] There are distortions in the observation which result of inopportune conditions. He observer could be improperly attentive or very far. The vision conditions could be very dark or contaminated with obstructions. Perhaps there could be interference form external sources which cause a distorted vision. Or it could be that everything was made by means of mirrors. In the science, as in any responsible attempt to know about the world, we must be prepared to convince ourselves and the others that none of these things have gone wrong and what we affirm to observe is a precise report. The observation, while is a useful constituent for knowledge, is an activity of description and justification.

In spite the need to distinguish the valid evidence from possible sources of distortion complicates the representation's standard image, does not destruct it. As soon as we assume that it is possible to know when an instrument is working correctly, and we know which elements in a situation of observation can inhibit or distort an observation, then we can go on saying that the correct observations are those which grant us access to the properties of the empirical source. It is also possible to support the standard image of observation when not "all" coincide with an observation we assume as correct. Those who do not agree can be put aside since they are not attentive, unwilling to look, or distrust of a distorted and limited perspective. The debates on such possibilities can be very contentious, but they do not radically threaten the possibility of a correct access and inter-subjective to the world. As a matter of fact, such debates are full of efforts to assure the competence of the observation asseverations, in terms of the standard image of the prerequisites.

The Constructivist opposition to the representation's standard image

The observation's standard image has been criticized in the last decades by several philosophers, historians and sociologist of the science, and nowadays is frequently discarded as a myth or a legend. A social alternative constructivist image (or just constructivist) has been prominently increasing, mainly in the social sciences and human studies. Constructivist theories of the representation are not all the same (neither are the "realistic" and "rationalistic" visions that they attack), but they are unanimous in their opposition to the theories on knowledge correspondence. Hey emphasize the language characteristics and the illustrated artifacts, which do no reflex previous ideas nor simulate the objects of the "outside" independent world. Constructivists see the representation as cultural artifacts, and not as objects inhibited of perceptions or as literal representations of what the eye meets. Alan Costall (1990: 273), for instance, it attacks the conception of the knowledge spectator and its associated supposition of a correlation between the self-contained world and a mental representation. He defines an alternative conception. "The presence on the surface of an image obstructs" the worldly scene by means of the remodeling and framing if its visual elements. Thus, where the world once imposed "itself" in our observations, now we are told that our representations "intervene" and "obstruct" in the world we witness.

The standard image of the representation is frequently conceived as out of fashion, but it would be deceitful to suggest it does not persuade anyone any longer. Not long ago, several prominent scientists, social scientists, philosophers and popularizers of the sciences tenaciously defended the idea that the scientific representations do correspond to independent natural facts that can be verified by means of observation (Gross et al., 1996). The argumentations and accusations associated with the so called "war of sciences" frequently create a polarization feeling among scientists, on the one side, when defending the natural reality, and critical sociologists, on the other, when insinuating that the representations of the scientists on the "nature" and "reality" are but mere fictions. Presenting in the most

grievous terms, the debate tends to the alternative models of the relation between representation and reality:

Standard image
Natural reality ——————> Representation
Social constructivism
Representation ——————> Natural reality

The inversion expressed in this scheme is also too simple and polarized. Perhaps a more subtle appreciation of the constructivist alternative can be given revising five aspects of the representation's standard image previously discussed: 1. Practical interventions are necessary to make the world observable. Instead of a passive vision of the observation implied in the idea of an "imposition" of the world, following Hacking (1983) it has been made common to emphasize the "intervention" of the world: how the scientists use technology to prove the world, extract and remark elements of the nature in the laboratory. 2. Particular observations and representations are created by groups and individuals with particular interests, their characteristics are reflected in the competition for credit and patronage. 3. Observations and representations are loaded with theories and concepts. 4. The observations and the observation's reports are not accessible to anyone. On the contrary, they are intelligible and acceptable only for the members of specialized communities who share professional commitments and tacit knowledge. 5. Persuasion and rhetoric are source of agreement among the observers, and among the observers and their audiences, on what can be observed.

Maybe this reverse image of the observation and representation is better exemplified by the practices by the end of the XX century in the molecular biology field. In this field, basic research and genetic engineering are entwined. Molecular biologists explicitly construct their objects of study, patent the products from their innovative labor, and they generally work for commercial companies, hospitals, and governmental agencies which have restricted their agendas. Their techniques and equipment are specialized, expensive and difficult to operate. Molecular biologists are usually part of rows not only on specialized facts and techniques, but also on ethical issues.

Although the reverse image is well exemplified by fields such as molecular biology, it is also possible to reinterpret the historical events of Galileo, Boyle and Newton in constructivist terms. Science historians tell us how Galileo struggled to persuade their contemporaries to accept the telescopic evidence (Feyerabend, 1975), how he described and named the Jupiter's moons, with the aim to support his patron de Medici (Westfall, 1985), and he adapted his scientific demonstrations to set the conditions and preferences of the Great Court of the Duke (Biagioli, 1993). As Steven Shapin (1984) brilliantly illustrates in his study on "literary technology" of Robert Boyle, the social process of observation is not a matter of describing an original observation so that other can reproduce it. On the contrary, it is rather a matter of virtual testimony where the original witness composes a report and/or a set of images of a collective practice so that others who are not in position can see by themselves. Virtual witnesses are seldom in a position from which they can observe the experimental effects going on; however, their position is such that they can trust or distrust the report. Virtual witnesses are those in an analog position to that of a member of the jury in trial. The members of the jury listen to the witnesses certifying on the events, they are shown the evidence and they are required to reach a verdict on the facts without having had the benefit of directly testify the events in discussion. Under such circumstances, the value of the credibility more than a direct experience is turned into a pertinent issue (Stone, 1995).

Deconstructing the realistic-constructivist opposition

The problem when there is opposition between the realistic conception, on the one side, tells us that the natural world "imposes itself" in the observations on it, and the constructivist position on the other side, stresses that human subjectivity "imposes itself" to the nature's representations, is that on both sides in this opposition assume that natural reality is separated from the practices which observe and represent it. When we follow the scientist in their practices making observations and experiments (or when we imaginarily retrace the ways of the historical evidence), we can appreciate they do not have the luxury to know how the natural objects in study are different from the local condition in which they are observed and illustrated.

The challenge they face is try to establish relevant differences between facts and artifacts, and to present them to others in their communities. When field and laboratory researchers are closely studied, it is possible to achieve an appreciation of how the objects in discussion are both "given" and "created". The practitioners' burden is to establish what counts as natural, artificial or ambiguous.

Contrary to the idea of an opposition between constructed and natural realities, ethnographic studies of laboratory projects show that scientists do not simply observe and illustrate specimens. Well now, they enclose them with carefully measured nettings, mark them with numbers and tags, extract with the utmost care fragments and residues, and turn them into graphic information (Latour, 1986, 1995; Lynch, 1985, 1990). Instead of imagining a static image of an observer staring at an object, we have a chain of material transformations, as an assembly line that transfers, extracts, preserves, analyzes and tags specimens. Hence, for instance, in anatomic studies of the brain tissue, an animal raised in a laboratory is linked to an experimental intervention. The animal is "sacrificed", the brain is removed and very thin sections are elaborated, tainted and tagged, so that they can be read as pages in a book, and then they encoded into a database (Lynch, 1985). This is a completely different image of the classic image of an observer contemplating the object and giving it some symbolic significance. There is no stable separation between the final object of a research and the practices by means it is researched. In place of this, we find a chain of intermediaries, where none of the constituents resides on one or another side of the large division among subjects and objects and signs or referents. We never detect a crack between things and signs, and we are never face to face to an imposition of arbitrary or discreet signs upon a shapeless and uninterrupted matter. We only see series of unbreakable well-chained elements, each one of them plays an important sign role for the previous and of thing for the coming (Latour, 1995: 169).

The adequacy of series or chains can be broken in several points. Contrary to Searle's (1995) distinction, where there is no clear and stable division among the contingent "social constructions" and the independent and "pure facts".

The race of a sample

In the rest of this paper we discuss a distinctive type of representational chain, which is not associated with a pure science, but with a notoriously impure science, that of forensic jurisprudence. Forensic jurisprudence is a science dedicated to the task of identifying suspects and victims upon the trace of the evidence found in crime scenes. This impure science is marginal discipline. It is situated between science and law, with a foot secure in the antiseptic laboratory whiteness, and with the other in the dirt and on the path of the crime scene (in this case we will follow stained shoe while it walks from a context to another). Testimony and virtual witnessing are the main resources and, sometimes the only, in order to convince judges and jury on the facts. Forensic analysis is not necessarily an abandoned science, for the forensic work is involved, it is said, in the most rigorous precautions against error as the very laboratory practices in basic fields as biology (Jordan and Lynch, 1998). In justice adversary systems, forensic analysis is usually carried out to inculpate, and the presentation of result in court is designed to support the cross examination from the defense and the impugnments that the witness experts for defense deliver. The representation ways are not pure and simple, they are impure and complicated. However, they are designed to be sufficient for convincing and condemnation. The point is: How is this done? Which are the sources from which the forensic evidence can close a case?

In order to direct these issues, we will examine a particular case, extracted from our research on the forensic uses of the DNA in the United Kingdom evidence.[3] This case's inculpation resulted from a murder's verdict of guilty in December 1995. In order to reconstruct the case, we interviewed police members who were in charge of collecting certifying and transforming the evidence; we also written testimonials used as evidence in the trial. Our point of attention is "the races of samples". The "race" metaphor is taken from Erving Goffman (1962) and it is used in a different context. Goffman used the concept "moral race" to describe irregular series of stages, many

[3] See 1.

of which were related to institutions and institutional processes, individuals pass through them in their way to reach a recognizable moral status. Goffman was interested in the typical idea of "race" paths which the personal experience and the moral status of a mentally challenged person sets. In this case we describe the "race" paths of a series of unanimated objects: corporal material samples collected in the crime scene (and, in respect to this issue, from garments supposedly worn by the suspect). Criminal law samples undergo a series of stages in their transformation into DNA profiles. Such as the identity transformations a person suffers to become mentally challenged, the samples suffer changes in their moral and epistemic status when they become legal evidence. They are identified with suspects and victims, the become "good" evidence of "guilty verdict" or, in an impugned trial, they are judged under their uncertainty or doubtfulness (and, as it was claimed by the defense during the broadcasted trial of the former football player O. J. Simpson, they can be alleged as the product of racially motivated police fraud). In this case, we make our best to reconstruct the organizational paths through which the evidence travels as samples subjected to material and epistemic transformations, they are collected in the crime scene and packed, moved into time and space, unpacked, analyzed and presented in the court.

The case[4]

In the morning of January 8th 1995, the local police received a report that a lifeless partially dressed woman's body had been found lying near a soccer pitch in Dunstable, a town near Luton, Bedfordshire, 20 miles to the north of London. The police answered the report, and along the day a series of detectives of the guard, official of crime scenes, forensic scientists, a surgeon police officer, a photographer police officer and other agents visited the place. The examined the victim's body, set up a tent around it, cordoned the crime scene and explored the area around the scene. According to the

[4] The information on the case was collected by Ruth McNally, during series of discussions with the police officers from Bedfordshire in 1996. The inverted commas in this section are of the Bedfordshire police. Summary of evidence.

police reports, the victim ("Miss X" in our account) was a 20-year-old woman, who had recently moved to England and had been working as a nanny with a local family. The family's mother reported her disappearance early in the morning.

The police collected a number of Miss X's garments, and the pathologist collected evidence from blood samples and from translucent spot (presumably semen) found near the genital zone of the victim. These pieces of evidence were tagged (IEW1 to IEW31), the victims body was taken to the morgue, where the other pieces of evidence (sample IEW32-39) were collected, registered and packed. All of these samples were taken to the Laboratory of Service of Forensic Science in Huntingdon. The samples relevant for our story are IEW8 and IEW11 and IEW36 (victim's blood).

The police and the pathologist registered the samples of the injuries of the victim, determined the possible cause of death and started to reconstruct the event immediately after the death took place. The evidence's outcome is that apparently the woman had been beat with the fist, and possibly knocked down in a car parked behind a bowling in an alley. Her jacket and a stain of blood were found near to the back of the bowling wall, and a police officer found evidence that her body had been dragged from a 75-yard distance to a tree's base next to the soccer field. There, apparently the assailant tore some of her clothes and tried to rape her, but he ejaculated on her body's surface. Either before or after the intercourse, the assailant tried to strangle the victim, kicked her viciously and stepped on her, creating severe injuries to her face, which, according to the pathologist's report, led to the victim to a suffocation death for her inhaled her own blood.

While the body was examined in the tent, then in the morgue, the police research changed that evidence. The mother of the family who hired Miss X told a police officer that the night before her murder she had taken Miss X to a night club close to the soccer field. The police officer obtained videotapes from a security camera in the club's entrance that night. Miss X's employer saw the videotapes and identified Miss X entering the place and then going out with a dark-haired white man, dressed in a bright-color shirt and a pair of trousers. This man —identified as Mr. Y— he became the first suspect. As a result of the media coverage, which broadcasted a

segment of the video on the local television, a man contacted the police identifying himself as a Mr. Y old friend. According to this witness, in the week when the murder took place Mr. Y was at home, for he had left prison, where he was convicted due to a sexual assault. The witness told the police he had been with Mr. Y that fatal Saturday evening, and he had seen him with a woman, whose description corresponded with that of Miss X. He also said that afternoon he had lent Mr. Y a shirt, a pair of trousers and of shoes so he could get dressed and those items of clothing had been returned the next day. The police collected those items from the friend's residence, and noticed the shoes had dirt and bloodstains. Those items were taken to the Services in Forensic Science in Huntingdon.

On Wednesday January 11th, the police arrested Mr. Y at his brother's house in Luton. The suspect tried to get away through a window but he was caught. In Dunstable Police Station, he was examined by a surgeon police officer, who took blood samples that were tagged (RJC9 and RJC10) and sent to the Laboratory of the Service in Forensic Science in Huntingdon. On Friday 13th in 1995, Mr. Y was convicted on murder and after being questioned he replied: "I am innocent ad I will prove it without a trace of doubt".

M. Lamb, a scientist of the Laboratory in Forensic Science in Huntingdon, revised several pieces of evidence sent there: the blood sample from Miss X (IEW36), Mr. Y's blood sample (RJC10), the pair of shoes and the borrowed items of clothing of Mr. Y, and the samples taken from Miss X's body. Mr. Lamb found evidence of bloodstains on the shoes, bloodstains and semen on the victim's clothes, and blood and semen in the evidence. He ran test with the blood from the shoes and said it could come form 1 to 16 people in the town, including Miss X. Mr. Lamb stated he had transferred the blood sample from Mr. Y (RJC10) and from Miss X (IEW36), as a blood sample taken from the right shoe (LA78) to Mrs. Lygo, from the Laboratory Services in Forensic Science. Mrs. Lygo carried out a STR profile (a DNA profile technique which only requires small sample sets) "in order to determine with a greater certainty the origin of the bloodstains in the sample LA78 [the right shoe]".

The samples of two pieces of evidence (IEW8 and IEW11) recovered

from Miss X's body altogether with other blood samples from her (IEW36) and from Mr. Y (RJC9), were transferred to another forensic scientist in the laboratory of Huntingdon, Dr. Harris, with the aim to develop DNA profiles with another technique: Single Locus Probe (SLP).

As a result from the STR profile analysis, Mrs. Lygo declared that, in her opinion, "the evidence transcription is 7,000 more probable" under the assumption that the bloodstain on the shoe (LA78) was from Mss X rather than any other unknown people unrelated to Miss X. Dr. Harris declared he had obtained DNA profiles from the IEW8 and IEW11, as well as from the blood samples (IEW36 y RJC9), and that the profiles from the samples matched with those developed from Mr. Y's blood, but not with those from Miss. Y. He declared that "the possibilities that a person taken in a random sample of people unrelated to [Mr. Y], having an AND profile according to the AND profile in the evidence were of 1 in 70 millions". Dc. Harris concluded that those findings showed that the stains of the evidence could be totally attributed to the presence of Mr. Y's semen.

Mr. Y objected this evidence when the case went on trial in Old Bailey in London by the end of 1995. By means of the interviews with the police we started a small, however, problematic, complication which appear during the trial. This complication sheds some light on the organizational production that sometime is called "chain of custody". The expression "chain of custody" describes a set of procedures to preserve the "continuity" of the evidence anywhere it is collected in the crime scene, or that it would be packed and sent to diverse storage facilities and laboratories. The "chain of custody" concept is applied to a set of police activities and technologies to collect, transport and analysis of evidence. DNA profile is just a sort of practice of evidence, but one especially interesting. Before going on to selected aspects of the chain of custody in this case, we need to say certain words on the DNA profile sampling.

From the ends of the 1980's, a number of bio-molecular methods were adopted for crime research purposes. The first of such methods, called Fingerprinting DNA, was invented by Alec Jeffreys from the University of Leicester. The genetic fingerprinting exploits the existence of several million of sites (loci) in the human genome, which are extremely variable in length

(poly-form), and uses the variation force to distinguish between people. These poly-form loci are called "repeated regions" since they are composed by several "repeated unions" (DNA sequences which consist in a few base pairs), which are successively repeated. The number of unions in a certain locus varies from individual to individual, and consequently the size of the repeated region also varies. Jeffreys and his team came up with a method to visualize this variation. Jeffreys' idealized representation (1993) on "How Fingerprinting DNA is done in 11 steps" describes in the two first steps, how DNA is extracted form the biological matter contained in the cellular core (in that illustration a blood sample with enough white cells is exposed). Then DNA is cut in fragments by chemical means of "enzyme restriction" (step 3).

Immediately, the matter is set in an Agarose gel and "conducted" by means of electric current that extends the fragments inside a different size column (step 4). After the DNA pattern in mixed with the gel, it is transferred to a membrane (step 5), a "probe" is prepared tagging a small DNA molecule with a radionuclide (step 6). Later on, the membrane is dipped into a solution that contains the probe so that this searches through the DNA a sample which links the DNA fragments that contain those samples, with the repeated regions (steps 7-9). Since Jeffreys' original method uses tests that link man different repeated regions (or loci), it is called "multi-locus probe" [MLP]. When the membrane is exposed to X-rays (step 10), the radioactive probe is visualized in the way of a band ornament, which sometime is compared to barcodes in a supermarket (step 11). Assuming this process works correctly, each band in the DNA fingerprinting, and the relative position of each band in the column was linked to a repeated region in the DNA sample, and the relative position of each band in the column corresponds to the length of a repeated region marked by the probe. In this way, DNA fingerprinting produces a visual register of the genetics variation. Jeffreys considered the precise pattern of the bands revealed through his MLP, a technique to be employed in "all the attempts and purposes", unique for each person with the exception of identical twins (Jeffreys, 1993: 26).

Jeffreys' MLP technique was used in the criminal cases from 1986 to 1989, when it was replaced by the SLP (single locus probe). In 1994, the

Service of Forensic Science of the United Kingdom introduced another method into the case of the crime. This method uses small repeated tandem sequences (sort tandem repeat STR) in combination with DNA fragments amplified by means of the polymerase chain reaction [PCR].

The SLP and STR techniques were used in the analysis of the evidence of the crime scene during the research of the murder of Miss X.

DNA profile with the single locus probes involve some of the steps presented in figure 1: the DNA is extracted from the blood, semen, skin cells and other bodily matter samples with enough DNA quantity; the enzyme restriction cut the DNA in millions of fragments, the samples are mixed with the gels and undergo electrophoresis; a nitrocellulose or nylon membrane which works as an absorbent paper that reproduces and fixes the pattern in the gel; the radioactive "probes" are washed on the membrane, and the result from the pattern is visualized with X-rays. In the SLP technique, each probe searches and ties a corresponding DNA sequence. Differently from the MLP technique probes, each singular locus probe is designed to be tied to the DNA of a singular repeated region. SLP technique visualizes fewer bands and it is easier to interpret than the MLP technique, but due to the same reasons it is also less discriminating. Each singular locus probe reveals one or two bands of different horizons for each sample, depending on this being homogeneous or heterogeneous in the specific locus. Each band points out the position of the DNA fragment which the probe is tied to. Comparing the pattern of the bands in different ways, the analysis looks for the links later. Instead of raising the discriminatory power of the SLP technique, a series of probes is sued, generally between four and eight, which are tied to different loci. The links are declared when two samples give the same band pattern for all the uses probes.

The metaphor of the Jeffreys' fingerprinting and the analogy with the barcode suggests that DNA fingerprinting of each person is unique; thus, DNA fingerprinting links indicate the identity (with the exception of identical twins' case). However, as many commentators have pointed out, with the SLP (and in some cases also with the MLP) it is necessary to count the links with estimated probabilities. Due to this, the "DNA profile" was introduced to replace the one of "DNA fingerprinting". When a linked DNA profile is

found, a statistical procedure is used to estimate the probability that a specific profile occurs at random in a selected sample unrelated to the individual, in a group's relevant population. Under the supposition that the genetic loci marked by different probes would be independent, when all of the probes used in the analysis of two samples turn out to be linked in bands, the probabilities for each link are multiplied altogether (this has proven to be one of the most controversial aspects in the sampling of DNA profiles). In the United Kingdom probable radii are generated for different "racial" groups, including the Caucasian, Afro-Caribbean, and the Asiatic. Hence, for instance, in our case, according to Dr. Harris' testimony, he used four singular locus probes to analyze two semen samples (IEW8 and IEW11) found in the crime scene and in the victim's (IEW36) and suspect's blood samples (RJC9). The doctor declared a link between the suspect's profile and (RJC9) and the profiles of the semen samples (IEW8 y IEW11), and a demarcation from the link between the victim's blood (IEW36) and the semen profiles. In his witness declaration, Dr. Harris said the results from the DNA profile were "70 million times more probable" if the semen found in the crime scene would have come from Mr. Y, than if they had come from another man unrelated to Mr. Y. When Mrs. Lygo ran blood tests in the blood on the shoe (LA78) against the victim's (IEW36) and the suspect's (RJC10) blood, she used the newest STR method, which uses a technique called PCR (Polymerase Chain Reaction), whose invention is attributed to Kary Mullins and Cetus Corporation (see Rabinow, 1996; Jordan, 1997, for a discussion on certain aspects of the PCR). We will not go deeper on the STR in this paper, but let us state this is the technique normally selected in the United Kingdom and it has been developed by the FSS since 1990, in order to compile the DNA database. The advantage of the STR is that it is utilizable with smaller samples than the DNA fingerprinting technique previously discussed, which is used in cases when the sample of the crime stain is small or degraded. However, the STR is also, it is said, highly susceptible to pollution from small amounts of "foreign" DNA molecules, which result confusing with deceitful results. Due to the pollution potential, and to the fact that the defendants have been able to turn this into a problem in a trial, numerous precautions have been constructed into the protocols to handle

and analyze evidence of DNA profiles. (O. J. Simpson's case in the United States involves a comprehensive and detailed examination of these issues)[5]

Chains of Custody

Thus far we have described DNA profile in a schematic and restricted way, in terms of ideal laboratory protocols. As it is frequently pointed out, forensic science is a marginal and "dirty" field; an impure science where personnel mixtures are interchanged, including police detectives, lawyers, technicians as well as panels of scientists. The practitioners handle the body's samples mixed and potentially contaminated, and they use different regimes of legal and scientific truth. Form the arrogant point of view of the National Research Council of the National Academy of Sciences of the United States —a group that retook two kept revisions of a forensic DNA profile (NRC 1992, 1996)—, forensic science is a field of practice with a doubtful status in the scientific hierarchy. However, forensic science practitioners do not always see it that way. According to an examiner of the case crime from the FBI, who was interviewed by Kathleen Jordan (1997: 140):

> […] We look at dirty things all the time, we do not work with pristine blood samples. We work with elements which have been laid… if a person has been murdered, their clothes are going to be dirty if we found the body next to the road, you know. For a scientist this is contaminated, for me, that is forensic evidence. Contamination to me… is something that was put there and it did not belong in there as a result of the crime. As a technician who would stick the nose, you know, into something [thus mixing the technician's DNA and the sample's DNA]. It is applied to all of the areas, not only to DNA. I mean contamination is latent evidence. If I pick up something and I am not wearing my gloves, I leave my fingerprints on it and they are not related at all. That would be contamination in my book.

Brackets identify a key association between contamination as a matter of ill-taking biological-molecular samples and the "dirty" job of the police

[5] For a series of articles in forensic science and Simpson's case, see the *Social Studies of Science* special edition, val. 28 numbers 4/5, 1998.

officers. Both of them are closely linked; and a potential problem that sometimes appears because of the defense right of the attorneys is that the laboratories' forensic work depends on "impure" materials, which are supplied by police agents, who have limited the scientific credentials, in some way, agents whose abilities and motives can be challenged in an easier way than those of the scientists staff, dressed in white, or scientists from expensive universities with impressive résumés. Here it is where the notion of chain of custody turns out to be very interesting.

Contrary to the schematic consideration of the DNA profile taking stated before, the chain of custody is extended beyond the laboratory, besides included the laboratory personnel, technicians and the scientists' panel.[6] A chain of custody goes from the laboratory to the crime scene and from the crime scene to the unseen crime events and, in the last instance, to the genetic history of the person who left corporal trace in the scene. The chain of custody is also extended to the court rooms to understand the complete series of material and literary practices that make up the history of a sample. The officers of the crime scene (Scene of Crime officers [SOCO's]) act ingeniously and torpidly as science agents, and their actions can become considerable at the court room due to the identity reference and integrity of the DNA profiles.

Exploring the connections: a shoe's history, a signature, and four parcel-delivery drivers

What is impressive about the chain of custody is that it is altogether supported by heterogeneous practices, in order to certify identity and establish credibility. The same elements which make it up can occasionally appear as disruption and dissolution sources. This chain is less similar to a line compounded by solid and repeated connections, and more similar to a rope with lots of threads, none of which running along the rope's full length. What is more, the threads are not made from the same matter, and the rope hosts bugs, patches and other potentially destructive elements. In order to use a more human analogy, the chain can be connected to a relay race where

[6] This point is made by Halfon (1998).

the baton goes from a runner's hand to another runner's hand, but in this case there a re a lot of overlapped relay races in different places; each one with its own characteristic "baton" and own possibilities to handle it. A complication we further ahead briefly discuss is that it is not always clear, from the start, who takes part in the relay race. As a marathon where some of the finalists found themselves as not registered from the beginning, the ambiguities and retrospective researches can appear on those who were really the significant actors in the chain of custody. When we try to reconstruct the races of the samples in the case we have discussed, we found it hard to specify beforehand what connections, threads, relays and fragility sources can be significant. The adversary situation in the court on the trial previously stated and troubled, "hides" connections which did not seem to be significant, or even visible, in respect to the trial. For instance, during Mr. Y trial, a problem appeared on the transfer of the blood sample taken from the shoe (LA78) on its way from Huntingdon to Aldermaston. The consideration of this transfer in the account of the police evidence can be schematized as follows:

[LA78]-Mr. Lamb (Huntingdon)—>Mrs. Lygo (Aldermaston)-[LA78]

During the trial, other agents and transfers became outstanding. One warning of the defense took notice of the following set of contingencies: 1. Mr. Lamb put the evidence (LA78) in an evidently mistreated plastic bag (a sealed bag, designed to reveal any attempt to open it). 2. A Huntingdon employee was responsible for the certification of the evidence transfer to the parcel service. 3. The employee (who remains anonymous) used the shortest way. He normally completed the "sample documents" certifying the evidence transfer. A document of the sample is a standard way used to record and denote the contents of the evidence samples anywhere they are moved from laboratory to laboratory. In this case, several samples were moved in the same lot, but instead of signing a new document of sample for each item, the employee photocopied a form with his signature on it, which he later filled in identifying the details for each item in particular.

When the defense attorney discovered the photocopied form, he demanded an original signature. The trial was delayed while the prosecuting

part tried to rectify the transfer in a more laborious way. The prosecuting part contacted the employee and the parcel service. According to the registers in the court service, the sample in discussion was moved by four drivers, each one of which took part in the travel from Huntingdon to Aldermaston. The connection in the chain can be seen as follows:

[LA78]-Mr. Lamb (Huntingdon)—> Employee —>
LD1—>LD2—>LD3—>LD4—>Mrs. Lygo (Aldermaston)-[LA78]

The higher office located the four drivers and two controllers who worked for the parcel service, and it arranged to have them all, as well as the employee, in Old Bailey, London, so that they could testify that the sample had been moved along an unbreakable transfer chain on its way to Aldermaston. Lamb and Lygo's testimonials, as well as the silent testimony from the evidence's mistreated bag, persuaded the defense to accept the sample left in Huntingdon was identical to that which had arrived to Aldermaston, and the employee and the four drivers were no longer required to play their cameo roles in the Old Bailey's trial. The rupture in the chain was repaired and at the end of the trial Mr. Y was sentenced. The "monster", as the local press nicknamed Mr. Y, was enchained and sent to prison without any hope of at least one free weekend.

Conclusion

We have traveled from the Galilean Saturnalia to the banal world of drivers and the ecclesiastics firms. We can not affirm the continuity of evidence. Then, what is it that this impure case makes perspicuous about "representation"? Let us retake some elements in our story. In the heart of it there was the representative correspondence: a link between a DNA profile developed from bloodstains on a shoe allegedly worn by the suspect and (LA78) and a profile developed form a blood sample taken from the assassinated victim's body (IEW36). The link between LA78 and IEW36 was produced by means of an extended chain of custody. The defendant attorney, skeptic from the chain examination, momentarily expanded it to reveal a sub chain of previously hidden agents (drivers), whose agency was questioned because of a signature's photocopy. A graphic representation of this expansion of the chain connections can be made with a something

known to children: "the chains of paper dolls". These are cut figures which are joined and fan-folded, hence the piled figures can be unfolded in a chain. In this case, the employee and drivers' figures are initially piled under the transference from Mr. Lamb to Mrs. Lygo, but after the defense's discovery of the photocopied signature, these hidden agents are unfolded and the chain is made evident (and troublesome), getting extended through their agency. After the prosecuting part starts a painstaking effort in order to certify the transfer by means of the direct testimonial, the drivers are again folded and put out of sigh, and the transfer between Lamb and Lygo becomes problematic once again. This worldly link was just one of the many which accompanied the movements of the samples. A crucial aspect of these connections is that they contain numerous bureaucratic mechanisms to testify the continuity of the transfers, which was supported as evidence value of the DNA profile that was presented in the trial. Eventually, the judge and the jury supported the link as reliable evidence. Perhaps one tends to say that science was bound to the verdict of the trial, but history is not so simple.

Let us consider how the link of evidence between Mr. Y and the crime scene was produced. Even a restricted and schematic amount of the DNA profile provides us with an image of a multifaceted chain of representations. What is more, the chain is made not of tandem repetitions of identical elements, but of re-representations of a diverse sort: denaturalized material extracts, designing fragments, gel graphs, paper transfers, radio active marks, X-rays expositions, visual links, and statistical estimations. Expanding the chain so that it goes beyond the laboratory, we find elements such as mistreated evidence plastic bags, parcel delivery services, forms, signatures and oaths. And adding the metaphorical of inscribed codes or auto radiograms, we find real barcodes traced on test tubes and other elements. These barcodes are organizational artifacts used to track the identity and secure the samples' integrity. Justice's rails are: elements that make it easy the legally adequate transport and the charge of the transformation of the evidence from a designed point to another.[7] Let us consider the highly detailed

[7] In order to illustrate the consideration of the work of the construction of the rails in another organizational context see Bowker (1994).

nature of the practices and researches that support or undermine the credibility of these representative devices. In the laboratories, protocols are done so that a technician officially testifies in the work of another. Through this process bureaucratic registers supply the identification, certification and the organizational memory. Unquestionably, the representation takes place, but not according to a sole rule or set of criteria, and never with the certainty the metaphysician demands.

Andrew Pickering (1995: 5-6) recommends we must escape from the "representative language" in favor of an interest in "pre-formativity", that "goes beyond the science-as-knowledge, and includes material, social and temporary dimensions of the science". Even if we agree with Pickering on "science is not only about representation", we do not see the reason to abandon the topic.[8] What must be abandoned is the idea that representations are immaterial signs, asocial and ageless. We do not see any contradiction to use the "representation" term with the aim to describe material objects as barcodes traced in test tubes, signatures in dirty evidence bags, the evidence in the very same bags, auto radiograms and computer impressions. These representational devices do not work to the same referential functions, nor are they autonomous. In some cases the representational devices incorporate or store their contents in such a way that it permits a visible comparison, a measuring, a protection and/or surveillance. Besides, the

[8] Wittgenstein's discussion on the Augustian language image (1958) does not suggest we must escape from the classical philosophical effort to recover the linguistic meaning and the certainty explaining the practice of pointing toward objects and give them names. On the contrary, he suggest that the image of the name and the display is one limited, and that "overvision" of the other different uses of the language is necessary in order to put it in perspective. Consequently, there is the possibility to pursue a "wittgensteinian" interest by the name, the reference and even the correspondence(s) between signs and objects, but what must be abandoned is the idea that such project will reveal the foundation of all meaning and certainty. From the point of view of the ethnography of the science (or in this case, the ethnography of the forensic work), the "representational language" remains outstanding: when the police, forensic scientists and the attorneys construct, defend and attack the chains of custody, exhibit, describe and skeptically examine the credibility of the evidence, which is supported as representations of current events and persons. In spite we do not want to insist

device acts as an image, it extracts or makes contents' abstractions of the material or of the surface. The issues on identity certainty and on the integrity of the representational functions are also directed in different ways. Identity and integrity of the samples is practically supported on complex traces of materials and bureaucratic contents: transfer and transcription materials, organizational protocols, certified copies, affidavits, barcode lectors, and as we have seen it, signatures. All of these exhibit different modes and combinations of materiality, observation, legibility, trust and virtuality.

We will conclude resuming an emergent image of the representation in the practice, which differs from the standard image as well as the constructivist inversion of this image: 1. The representation in the science is a matter of making the objects realizable (observable-reportable). The images and illustration can have a common place in the repairing practices of a field (or crime scene), when fixing instruments, cultivating objects, certifying identities, and so on, but they are a part not the whole, of the objects' realization. 2. The adequate correspondence between the representational devices and the representational objects is a contingent product of the representation practices. This does not mean that the correspondence would not be real, but that evident correspondence is not the beginning or the end of the story. 3. the skepticism on the representational adequacy, as it happens in the United States and United Kingdom's adversarial courts, can open troublesome connections (or possibly troublesome) in a chain, with the purpose of exposing sub-connections which were not at first apparent. 4. The integrity and fragility of the chains, and the rupture and the fragile connections repairing, are organizational realizations.

In this case we observe that integrity of the chain was granted not by the natural identity that ran from an end to another, but by a complex

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on the fact that the representation is just a game in town, it seems to be all of the reasons to research into the representational practices, materials and languages as pre-formative realizations. Pickering's disenchantment with the "representational language" can root with its continual enchantment on the possibility to foresee a Theory of everything [TOE]. While we do not share the enchantment, we can describe the representation and its circumscribed language without worrying about insignificant and metaphysical fingers.

agreement of technical devices and organizational practices which worked to register, certify, and practically make sure the samples remain identical to themselves, that the symbols symbolize the objects, and that the natural identity of a monster coherently emerged from the whole.

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