Chapter 6
Forensic Archaeology: State of the Art of Archaeological Techniques in France and Other Latest Developments. A Case Studies in Toulouse Region (South West of France)

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Abstract This paper provides a brief overview of the role of forensic archaeology in France, focusing on search in particular, observing and evaluating different scenarios relating to searching for the missing. These observations, and especially the research, will be focused on the Toulouse region.

Keywords Forensic archaeology · Forensic anthropology · French National Gendarmerie · Buried body detection · GPR · Human remains searching dogs · Metal detectors · Earth-moving machines

6.1 Introduction

Due to its territorial jurisdiction, the institution of French National Gendarmerie is most confronted with cases of missing persons who are believed to have died in a criminal context and who have been illegally buried. Each year, depending on the progress of investigations, research operations are triggered. Despite considerable efforts in recent years, these search operations generally do not utilize all the skills

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available in this field. Although the Forensic Sciences Institute of the French National Gendarmerie (*Institut de recherche criminelle de la Gendarmerie nationale* – IRCGN) recognizes the interest of forensic archaeology (Ducrettet et al. 2013; Schuliar et al. 2015) and has begun to take interest in some of its problems, there is, as yet, no national protocol in France, similar to that in Belgium (*Necrosearch*), for example (Schotsmans et al. forthcoming). There is no single point of contact in the French National Gendarmerie for such type of problems. To date, three specialized services of this force have been called upon. Two are located within the Forensic Sciences Institute of the French National Gendarmerie in Pontoise and another, with which they are not in contact, is located within the French National Gendarmerie Dog Training Center (*Centre national d'instruction cynophile de la gendarmerie* – CNICG) in Gramat (Lot). Moreover, the existence of forensic archaeology in forensic criminal investigations is not yet fully formalized, even though the community of forensic doctors fully understands the issues at stake, and anthropologist intervention in the field is a recognized added value in various cases. Finally, forensic archaeology, which some people prefer to call forensic archaeology for these reasons, is confined exclusively to the research and excavation of skeletons. All the research concerning the caches of buried weapons, buried bags containing jewelry, gold, etc. is within the scope of forensic archaeology. But, at present, there is only one case where archaeological methods have been applied at a crime scene that did not contain human bone.

This observation, and especially the research conducted in the Toulouse region, has recently led to new reflections on the subject, in particular by accompanying new actors whose skills have been put to good use to complement the methods generally used.

6.2 Problematics

Except in one case (cf. *infra*), forensic archaeology has often been used for the search and excavation of buried bodies. This is why the Forensic Sciences Institute of the French National Gendarmerie, the only institution to have tried to formalize it, has integrated it into the department dealing with anthropology. However, as is taught at the university and in the military, in many other cases which are regularly the subject of legal proceedings, the archaeologist could be asked to find and especially document the digging in the ground: drums of buried toxic products, caches of active or non-active weapons, illegal items hoarded by criminals and hidden in the ground, etc. All these cases, which obviously require extensive observation of anomalies in the soil and at the edges of the digging pit, do not integrate the skills of the archaeologist. This is all the more damaging because, in some cases, the use of GPR has required a preliminary scraping. This operation would have made it possible to have a reading of anomalies in the soil and the signs of any digging.

To date, we have only one example in France of the use of archaeology in forensic investigations that has nothing to do with the search for a cadaver. These are the

investigations carried out in the context of a bank robbery tunnel in the Toulouse region. The archaeologist employed, whose mission was to find traces of digging, also had the task of managing this site for forensic purposes. It was an interface between the civil engineering specialists and those of the Force, particularly with regard to the earth-moving machine and how to get them involved.

Detecting a buried body requires the intervention of specific resources and specialists who often ignore the operational capabilities of the various actors deployed on the site. In France, Crime Scene Technicians (*Technicien en Identification Criminelle* – TIC) and Criminal Investigation Units (*Cellule d'Investigation Criminelle* – CIC), a special unit with Crime Scene Technicians (*Technicien en Identification Criminelle* – TIC), located in each departmental capital (in the gendarmerie group), and the Crime Scene Engineers (*Coordinateurs des Opérations de Criminalistique* – COCrim) can take help of the following skills and services:

- Ground-penetrating radar located in Sound & Image Recovery Department of the Forensic Sciences Institute of the French National Gendarmerie (*Dpt Signal-Image-Parole*; IRCGN) in Pontoise (Val-Oise) (Fig. 6.1).
- The human remains searching dogs (RRH for "*Recherche de Restes Humains*"), known as cadaver search dogs led by dog handlers of the Dog Unit National Investigation Group (*Groupe National d'Investigation Cynophile; GNIC*), based in Gramat (Lot), in the southwest of France (Fig. 6.2).
- The archaeo-thanatological skills that are taught at the Forensic Sciences Institute of the French National Gendarmerie (Coulombeix et al. 2014) and in some

Fig. 6.1 Ground-penetrating of the Forensic Sciences Institute of the French National Gendarmerie during an experiment

Fig. 6.2 Cadaver dog in action (real case)

French forensic laboratories but which are not used as they should be. But in these laboratories, anthropologists are not involved in the search of bodies, only sometimes in discoveries. In cases concerning the Toulouse region, they were carried out by an agent of the French National Institute for Preventive Archaeological Research, trained at the Forensic Sciences (Paris 5 University) (Georges 2009) in addition to his degrees in physical anthropology and archaeology. He is also a forensic expert in the field of anthropology (crime scene and identification according to the nomenclature of French experts). Although it is not systematically implemented, it is increasingly recognized that this archaeo(thanato)logical knowledge is absolutely essential in such crime scenes. Forensic doctors, who are not trained for the excavations, are the first to recognize it (Baccino 2011). The forensic archaeologist is indeed able to interpret the signs of digging in the ground, often invisible on the surface, but which appear when scraping is carried out. This is why it is recommended that a suitable mechanical machine be used (Georges et al. 2012, 2013) (Fig. 6.3). In addition to their expertise, the intervention of archaeologists at crime scenes is also explained by the fact that archaeologists have, in recent years, come closer to more recent chronological contexts and are being recognized for their ability to manage large-scale archaeological sites (Georges 2009, 2016).

There is no obligation for the magistrate or investigator to summon a specialist. There is no protocol on this, which is why the employment rules that we have begun

Fig. 6.3 Archaeological scraping (real case)

to implement through university courses and during the training of the French National Gendarmerie are not yet widely applied, including by the Forensic Sciences Institute of the French National Gendarmerie, which is the driving force in this field.

For organizational reasons, the ground-penetrating radar team is more often involved in the search for bodies, without archaeologists and anthropologists accompanying them. These signal specialists do not have any knowledge of digging, taphonomy, etc., and especially of the ground-penetrating radar, which has enormous limits in rough terrain, the forest (cf. *infra*), and clayey and humid soils. It appears to the people who solicit it (and who do not know its operating principles) as the best tool to find the victim. In these times of technophilia, the presence of a screen allowing a so-called direct reading makes it easy to explain it. This is why people don't really understand that the absence of a result with only the ground-penetrating radar alone is not a result. Numerous cases, some of them highly publicized, are concerned by this methodological flaw in France. It should be noted, however, that many other geophysical methods could be used, but generally require post-processing of the data (no direct reading). This problem of the expression of the result is similar to that with dogs dedicated to the search of human remains with a 6-year-old record in France. While older contexts may be favorable, the absence of results for older cases is irrelevant, including for more recent cases, knowing that it is recommended to create wells of odor (Fig. 6.4) close together (at least after every meter) within a well-defined period of time, which is not always possible. In fact, as Anglo-Saxon literature shows, only archaeological investigations, which include scraping with earth-moving machines, give the assurance of a result. Of course, this poses a problem for open areas, large surfaces and inhabited house plots with landscaped gardens.

Fig. 6.4 Doing smell wheel (real case)

6.3 Observations

In the Toulouse region (Southwestern France), recent criminal cases have led investigators to suspect, several years after the commission of the facts, that the victim was illegally buried in a wooded area where it has not always been possible to restrict the investigation to less than a few hectares. In this environment, it's easy to hide the body using the immediate camouflage of the stigmas resulting from the digging of a pit (presence of a permanent carpet of leaves), whose anomaly of relief tends to disappear in the passing years. It was not possible to engage the ground-penetrating radar in such cases. The strong root development of trees prohibits the use of ground-penetrating radar. The experts of the Forensic Sciences Institute of the French National Gendarmerie say that the numerous roots would create many anomalies, making it impossible to distinguish them from a buried body signal. The length of time since the alleged illegal burial and the environmental context are sufficient to explain why we consider this as a particularly difficult operation. Moreover, the fact that in each case the research area extends over several hectares confronted the survey actors with a new difficulty. This is the reason why it was decided to hire

new specialists for this type of operation: the Military Search (*Fouille Opérationnelle Spécialiée; FOS*) of the 17th Parachute Engineer Regiment (*17ème Régiment du Génie Parachutiste; RGP*), which had already been called upon in the region to search for firearms and ballistic elements. The 17th Parachute Engineer Regiment is a French military unit based in Montauban (Tarn-et-Garonne). It is organized, equipped, and trained to carry out the engineering support missions of the 11th Parachute Brigade, for which it provides all the specific tasks of the assault engineer in an airborne, helicopter-borne, and mechanized environment, such as assault clearance, depth reconnaissance, deployment assistance, mine clearance, and clearance operations (munitions, explosive devices, etc.). It has had a constant presence since 1975 in all the conflicts in which France was involved.[1]

The Military Search team of the 17th Parachute Engineer Regiment was born in 2008. It was the first of all Military Engineer Regiments to be created and engaged in external operations. The parachutists who make it up are in charge of implementing technical and scientific forensic techniques for military purposes for gathering information (Lafaye 2012). The primary mission of the Military Search team is to combat improvised explosive devices (IEDs) by collecting clues, in the same way as Crime Scene Technicians, to stop the actors of an attack. In external operations and in front of combat troops, this results in the search for explosive or ammunition caches and possibly DNA samples and fingerprints. In order to retrieve intelligence from the field where it is located (housing, vehicles of all kinds, personnel, etc.), these soldiers have special equipment (Fig. 6.5). The metal detectors in their possession, some of which are specific to this section of specialists, is one of these (see below) (Fig. 6.6). Accustomed to working in various environments to highlight points of interest (landscape anomalies) and anomalies of all kinds and walking long distances and settling in degraded environments, these soldiers proved to be an essential accompaniment to the usual arrangements. All the more so because their technological means of self-staffing add a skill that is not found anywhere else, namely, the detection of metallic element present on and/or in the body, which had never been done before, at least in such a systematic way. However, in body search operations, the detection of metallic elements present on telephone, jewelry, etc. or in the body (ballistic or medical elements) had never been used. Indeed, the involvement of this Military Search team in the national territory for the benefit of the National Gendarmerie was not an aberration, even if its missions during external operations are different. In fact, as engineer soldiers, they were particularly receptive to the discourse on the use of earth-moving machine in such situations; they can drive it (Fig. 6.7). These soldiers have adapted and refined its procedures, which were previously designed to work in a very limited time slot and in a hostile environment (Lacrêpe et al. forthcoming).

[1] http://www.defense.gouv.fr/terre/l-armee-de-terre/le-niveau-divisionnaire/3e-division/17e-regiment-du-genie-parachutiste

Fig. 6.5 Military and forensic equipment of the Military Search team

Fig. 6.6 Metal detector operator in action during an experiment

Fig. 6.7 Scraping by a soldier (real case)

6.4 Toward a New Approach

When possible, all means usually summoned in the Toulouse region are for the search of bodies, whatever the environment, including parachutists of the Military Search. But in the cases that we had to deal with, all involving large forested areas, the field was not conducive to the deployment of the ground-penetrating radar. Some areas were difficult to access even for cadaver dogs and their handlers, but neither the environment nor the large surface area could be considered a problem, even if it was preferable to make relatively deep smell wells at regular intervals (at least every meter) over the entire research area. This was obviously not possible in the cases we are referring to in the Toulouse region. The twin dog handlers' methodology made it possible to cover the whole area. These interveners, such as the archaeo-thanatologist, whose work consists essentially of discriminating between bones that may have been discovered on the surface, directing the scraping and digging in the event of discovery, are therefore likely to highlight anomalies of relief to be tested. But the concentration on the dog's work and the permanent reading of his reactions do not really allow him to be interested in the different peculiarities of the field. That is why it was necessary to systematically involve specialists in reading the environment, knowing that we regularly accompany them in terms of training. We were therefore no longer alone to explore the entire research area on foot.

This approach, which is the beginning of the protocol we are trying to put in place, makes it possible, under difficult conditions, to manage lengthy research in

large areas. The joint intervention of the various specialties, whose complementarity appeared to be obvious over the course of the cases, led to the testing of a common procedure to be efficient and rapid. The main idea is that the work of one entity should not be hindered by the exploration being carried out by another. This procedure is composed of ten phases (Éric et al. forthcoming), the originality of which lies in the creation of corridors, allowing the multidisciplinary intervention of the actors, and guarantees the quality of investigations by ensuring that they have actually covered the whole area. In the forest, with a relatively large number of operators on an area that it is not possible to observe from a single point of view, it would be easy to inadvertently forget parts of the land. The installation of a specific signaling system, according to traceability criteria, allows an immediate reading of the current operation.

The characteristics of mission preparation (phase 1), an essential step that is not limited to the material aspects and is all too often neglected (taking into account environmental data, prospecting by aerial imagery, etc.), as well as the coordination and designation of a control point (phase 2), designated under the acronym ICP for Incident Control Point, correspond to military requirements but are adapted to the forensic context of France. The designation of a control point partly responds to the recognition of the zone (phase 3), the first real act of field research. It is led by the scribe and group leader to see and determine where the research will begin and stop, depending on the exchanges with the investigator. However, it is desirable that representatives of all the intervening entities be present so as not to generate queries during the operation. This preliminary examination of the research sector also confirms the nature of the soils and vegetation, which are apprehended during the preparation phase (see above), and even confirms the use of various means of action besides defining priorities.

The delimited area is then marked (phase 4) (Fig. 6.8). The corridors are marked by yellow braid, denominated with a letter and numbers according to a system based on geolocation; the GPS coordinates of the ends of the lanes are systematically recorded and plotted graphically.

The size of the lanes may vary according to the configuration of the field and, above all, the length of the plot. The average width, generally equivalent to 5–6 m, is a good compromise between the methodology of dog handlers, who pay attention to the physiological requirements of their dogs (cf. *infra*), and the need to operate the scraping machine for checking anomalies. The action of the cadaver dogs is a delicate moment; they work first (phase 5) and alone for a while, until several corridors have been checked. It is indeed recommended not to disturb them by working close to them and, above all, not to come before them. Manual or mechanical checks would generate clods or piles of soil that could visually and olfactorily disturb the dogs. The size of the corridors also allows each dog handler to process it at once. Indeed, given the concentrated effort that this type of search requires from the dogs, each master carries out a rotation with his own dogs, who work only a few tens of minutes at most in one rotation. Their effort appears to be intense.

With at least one corridor left free of any intervention between them and the one where the dog and its master are working, the soldiers of the Military Search team

Fig. 6.8 Corridors (real case)

enter into action with their different metal detectors (phase 6). This knowledge on the detection of metallic objects present in the ground, with possible discrimination according to the nature of the metal, aims to find the victim according to the metallic elements that could be on or in his body.

In order to organize the research and facilitate the reading of the progress of work for all staff, a signage system based on a color code is systematically implemented. This signaling makes it easier for the investigator to resume work when the search is interrupted and the anomalies observed are located, as well as for the investigator to instantly read the current search operation, which is not insignificant. Indeed, this type of operation is often an opportunity for the latter to take time off to review different places of the case or to exchange with protagonists or interlocutors, especially when the surgery lasts a week. This signaling also indicates where the detected anomalies are located and whether excavations (Phase 7) are in progress.

The last three phases concern the topographic surveys (phase 8), the rehabilitation of the area (phase 9), and the report of the search operation (phase 10).

The Military Search team chose fiberglass stakes that do not disturb the action of the detectors because of their composition. They are arranged on the starting base and in the middle of the corridor so that they are visible to all. For marking of detections and excavations, there is a picket line at the beginning of the corridor and four pickets that mark the area of interest. Unmarked corridors downstream of the work

area are considered to be made. The others, located upstream from the white stake ("corridor not made"), remain to be investigated. The selected colors are visible from afar, even with a relatively dense vegetation cover.

6.5 Conclusions

The search for buried bodies is a complex task, regardless of the environment in which it takes place. This is even truer when the place envisaged for the illegal burial of the victim is in the forest or in a place not really localized (research on large surface) and when the years have passed. The intervention of many specialists from different backgrounds is, without a doubt, the key to success. Unfortunately, this is rarely the case in much simpler cases, despite the fact that the IRCGN sends in specialists.

In the context of research on areas, often several hectares in the Toulouse region, a new approach has therefore been put in place, with the idea of imposing it on a national scale. The aim is to manage the simultaneous intervention of different specialties although no protocol currently exists. It will allow each person to apply his or her own methodology without compromising the effectiveness of the other. It is in this sense that the approach presented here has been thought out and adapted; it unquestionably makes it possible to work in the best conditions without creating harmful disruption for the continuation of investigations by other specialists. Above all, the marking of the corridors ensures that the entire surface is treated by each of the specialists, making it possible to follow the progress of research and the various interventions (residual human remains search dogs, metal detection, archaeological stripping) live, by means of a color code, even in dense environments and on very large surfaces.