

**THE DETECTION OF
HUMAN REMAINS**

ABOUT THE AUTHOR

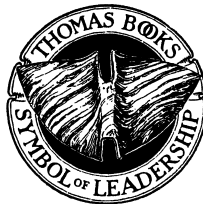
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Second Edition

THE DETECTION OF HUMAN REMAINS

By

EDWARD W. KILLAM



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*To David Yates and Clifton Browning
Special Agents
Federal Bureau of Investigation,
Glenwood Springs, Colorado*

Good Men Gone

FOREWORD

In 1986, law enforcement officials used techniques standard for the time to search for and exhume several buried bodies on a remote ranch on the eastern Colorado plains. Usually in a body exhumation (in Colorado and elsewhere), law enforcement officials used informants or obvious clues to locate a burial, and then would employ shovels and backhoes to retrieve the body. At that point, the body was taken to the medical examiner or coroner who would gather clues for identity of the remains and cause and manner of death.

After backhoes were used in that eastern Colorado case, several individuals involved with that recovery met to discuss the techniques employed and to ask themselves if there could be a better way to conduct such an investigation. This was the catalyst for a new group of scientists and law enforcement officials (later named NecroSearch) who would experiment with better ways to look for clandestine graves and to meticulously retrieve the evidence (including the body) from those graves.

At the infancy of NecroSearch, Edward W. Killam was finishing his Master's degree in anthropology at Colorado State University, and the first edition of this book was the extension of his thesis. He was one of the first members of NecroSearch, and for about 15 years he has been effective in helping to rewrite the standard operating procedures for integrating law enforcement concerns with the potential for science to contribute to the detection of human remains.

Today, NecroSearch is a multidisciplinary team of individuals from law enforcement, academia, and industry that has softened the barriers between law enforcement and the scientific community. NecroSearch consists of anthropologists, archaeologists, dog handlers, entomologists, botanists, geologists, geophysicists, chemists, investigators, and experts in animal scavenging, criminalistics, data processing,

meteorology, remote sensing, underground mine exploration, and underwater methods. Everyone donates the time necessary for search and recovery, and is only reimbursed for expenses. Each volunteer must undertake a year of meetings and casework before being invited to become a member.

Any search for a clandestine grave concentrates on at least two factors: the capabilities and potential behavior of the perpetrator, and the ways in which the act of burial (or other ways in which a body may be hidden) disrupts the natural environment. Important examples of the former include:

- Did the perpetrator likely bury the body?
- How far is the perpetrator likely to carry the victim?
- How familiar is the perpetrator with the suspected burial area?

Just as important as the recognition of the importance of the capabilities of the perpetrator, however, is the analysis of the ways in which the natural environment might be changed by a burial. Any search starts with the premise that within a given natural environment, a grave disrupts, for instance, the existing order of the geological strata, geophysical properties, and plant communities. Depending on the environment, it takes time for these disruptions to dissipate and to return to normal, and during this time, there must be ways to locate the disruption in this natural order. Indeed, one usually does not look for a body in these circumstances, one looks for the disruption. We look for *anything that is out of place*.

Search techniques like those used by NecroSearch are not only useful for single graves, but to human rights and war crime investigations. Mass graves worldwide disrupt the environment in similar ways, though on a grander scale, and techniques useful for locating graves containing a single individual are also useful in locating mass graves. NecroSearch has recently volunteered to conduct a class on the location of graves to individuals in Guatemala and will expand that invitation to anyone in the world active in investigating war crimes with mass graves.

This book represents the updated edition of an innovative book that has been used by forensic specialists for over a decade. Scientists and investigators around the world are researching techniques for locating clandestine graves in various environmental circumstances. This book

is intended as an introduction to the various methods employed in the location of clandestine graves, and most of what we know is included within this book. In fact, this protocol is what NecroSearch follows when asked by law enforcement to help with the location of remains.

With the increased interest and recognition of the ways in which science can contribute to the investigation of crime, this is a welcome second edition.

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*For contact information about NecroSearch International, and to obtain information about the various disciplines contained within the group, please visit the website: www.necrosearch.org. Please note that NecroSearch can only respond to requests for assistance from the law enforcement as we do not want to compromise evidence in a case.

FOREWORD TO THE FIRST EDITION

Serial murders and mass murders are becoming ever more common (Levin & Fox, 1985). It is also becoming apparent that this kind of violence brings with it the call for novel and sophisticated methods for handling the “crime scene.” The discovery, retrieval, identification, and postmortem examination of bodies that are part of a mass disaster (whether of natural, accidental, or criminal origin) pose challenging technical requirements for coroners, medical examiners, and police crime scene investigators (Leyton, 1986; Damore, 1981; Michaud & Aynesworth, 1983).

Of particular importance is the discovery and initial processing of human remains. Recent history of some mass murders in the United States suggests that the processes used to discover and retrieve bodies that are the result of serial killings, or of individual killings that are being concealed, are less than elegant. Some of the murders resulting from so-called satanic perversions pose challenges for discovery of the human remains deriving from such viciousness and demand sophisticated analysis of the scene or scenes of the atrocity. Failure to meet adaptively these galvanizing events may well result in the prosecution of many such cases rendered more difficult than necessary and too often less adequate that the seriousness of the crime or incident warrants.

Every possible kind of scientific and technical “know-how” must be employed in the investigation of mass and serial murders to insure that complete and valid evidence is guaranteed for the prosecuting attorneys. Killers like Ted Bundy, finally executed on January 24, 1989 and estimated to have murdered 40 to 50 young women, have exploited our legal system and showed nothing but contempt for their victims. It was the search for one of Bundy’s victims that first interested the author, then an officer with the Aspen, Colorado Police Department,

in methods for finding human remains.

Edward W. Killam, in this present volume, has addressed himself to one critical aspect of the problem; the detection of human remains. He has also emphasized a widely neglected specialty with critical implications for the retrieval of bodies; that is, field archeology. It is apparent from the rather chaotic and unrefined methods used to recover bodies in many recent mass killings that better methods are demanded. (The John W. Gacy and the Juan Corona mass murders in the 1970s are cases in point.) Some mass murderers commit such enormities that our present thinking patterns have not been adequate to design appropriate investigative procedures in response; in the early 1980s the 150 or more murders carried out by Henry Lee Lucas and the more than 40 murders attributable to Gerald Stano are beyond our present capacity to respond totally (Leyton, 1986).

Archaeologists who work in the field (at "digs") have remarkably effective methods for garnering from sites large amounts of relevant information about human remains found and about the processes that went into the hiding of the remains. With minor adaptations their field research modality can and ought to be applied to the recovery of human remains of legal interest (e.g., Morse et al., 1983).

The present volume is unique in being the first of its kind. The author presents in a detailed but understandable form the various methods for finding buried, concealed, or discarded bodies. He, as an experienced private legal investigator, is keenly aware of the courtroom implications of every step in the detection and recovery of evidence. His book is a valuable "how-to-do-it" manual for investigators charged with finding human remains of forensic science interest.

The volume is a needed and competent addition to the forensic science literature. It should be of interest to police investigators, prosecuting and defense attorneys, coroners, medical examiners, civil defense authorities, and others faced with the detection and retrieval of human remains lost from criminal or other causes.

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PREFACE

This work is intended as a guide to the various methods for locating human remains. Most of the information is applicable to both archaeological and forensic situations. My intended audience are those who become actively involved in the hunt for human bodies, such as historic and prehistoric archaeologists and the law enforcement community, including coroner or medical examiner investigators and search and rescue teams. I believe it will also be of benefit to criminal justice prosecutors who need to prepare search warrants and court orders or must qualify and question expert witnesses.

This work contains guidelines for the investigation of missing-person or homicide cases which require comprehensive body search planning. The core is a guide to methods for locating surface and buried bodies. The methods considered include ground contact, proximate, and remote sensing techniques. The categories of methods are non-intrusive pedestrian searches, surface-penetrating ground searches, geophysical prospecting techniques, remote-sensing methods, aerial photography and interpretation, and paraphysiological techniques. The underlying operational principles, advantages and disadvantages, and possible applications of each method are discussed.

I have six broad objectives in preparing this work. The first is to assemble basic information on search methods and condense that information into a single source which can be a ready reference for practitioners. A number of these search methods may be known to archaeologists but not law enforcement, and vice versa. Some of these methods, or at least their application to body-search situations, may be new to both groups.

Secondly, I hope to provide sufficient information for practitioners to try and use the “do-it-yourself” techniques. I hope the information presented gives the reader sufficient confidence to try such techniques

as oblique infrared photography, probes and gas vapor detectors, metal detectors, etc. This work should assist in choosing and purchasing the necessary equipment for these methods. Other techniques are beyond the “do-it-yourself” category and require the use of specialized equipment or professional expertise.

My third objective is to provide decision makers with guidelines for recognizing a situation that needs outside consultants. The information presented here will enable a knowledgeable consumer to ask questions of experts before making a hiring decision. There is also enough information for the employer to judge the results of the expert’s work and decide whether the search should be continued with current methods.

A search supervisor or case investigator may have to explain his decisions to superiors, the press, and the victim’s family. He may have to justify his budget expenditures in light of the search results. Accordingly, my fourth objective is to provide the data necessary to balance time, manpower, and costs against expected results. Beyond justifying his choices, a search supervisor must be able to explain why other techniques were not used, such as refusing to use psychics and dowsers or suspending a magnetic search because of sunspot activity. In some situations, an investigator may have unwanted search methods thrust upon him, e.g., a family willing to supply search volunteers. The investigator will need the sophistication to accept such assistance gracefully and maximize its benefits without compromising other search efforts already underway.

My fifth objective is to assist an investigator in compiling his own set of standard operating procedures (S.O.P.) for a search effort. A body search S.O.P. should contain investigative and interrogation suggestions which can narrow down the search areas. It should provide information on choosing search techniques based upon the totality of environmental circumstances as well as the equipment and expertise available. It should also specify the order in which search methods will be used so that early searches do not confound later efforts. For instance, aerial photography should be used before foot searches so that the search area is not scarred by search vehicles and ground teams. The S.O.P. should present the basic guidelines for conducting searches without damaging the search area or destroying valuable physical evidence.

My last objective is to provide a list of references for investigators who want additional information. I have tried to emphasize the best

comprehensive texts I have encountered, so that the professional can build his personal reference library. I have also included sources of advice and assistance found outside books and journals. I hope this work encourages communication among the geophysicists and archaeologists found on college campuses, the law enforcement and search and rescue personnel in the field, and the manufacturers and vendors of search equipment. One of the hallmarks of the forensics field is rapidly changing technologies, which means an investigator must be constantly receptive to new information and suggestions. Better communication and mutual assistance among academia, law enforcement, and private industry can benefit all concerned with the successful conclusion of a search problem.

E.W.K.

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**THE DETECTION OF
HUMAN REMAINS**

Chapter 1

FORENSIC ANTHROPOLOGY

Whoever thou art that findest me lying, respect my remains: they are those of a man who consecrated all his life to being useful, and who has died as he lived, virtuous and honest. Not fear, but indignation, made me quit my retreat, on learning that my Wife had been murdered. I wished not to remain longer on an Earth polluted with crimes.

–Suicide note of Jean Marie Roland de la Platiere. Appears by permission of Philosophical Library Publishers from *Dictionary of Last Words* by Edward S. LeCompte, 1955.

The detection and recovery of buried bodies is not a concern just to law enforcement. It has long been a focus of anthropological and archaeological study as well. Anthropology is a broad academic and research area commonly defined as “the study of man” (Guralnik, 1970). It is classically divided into four major subfields: cultural anthropology, linguistics, archaeology, and physical anthropology.

Cultural anthropologists specialize in man’s cultural patterns and social institutions, such as family structures, religions belief, etc. Funeral and burial practices are within the realm of cultural anthropology. Linguistics is the study of languages, their origins, structures, and relationships. Archaeology concerns itself primarily with the life ways and cultures of ancient peoples, based largely upon the excavation and recovery of buried objects, including human remains.

Physical anthropology treats man as a biological species and has a number of specialties within its domain. These include primatology, which is the study of living primates, osteology or the study of the

bones and skeleton, and paleontology directed at fossil primates, including man. Physical anthropology also includes the study of human genetic variation and forensic anthropology, the examination of skeletal material in forensic situations. Typically, the archaeologist is highly trained in excavation techniques and the physical anthropologist is more skilled in the actual interpretation of skeletal remains. A good forensic anthropologist will bring all the fields of anthropology (cultural, archaeology, etc.) to bear upon the legal problem at hand. He or she will be knowledgeable in the field of taphonomy, the study of events after death, from decomposition to fossilization (Haglund, 1989). Taphonomy has emerged as its own interdisciplinary field of study (Haglund & Sorg, 1997).

Those physical anthropologists engaged in forensic examinations can assist in the identification, or at least description, of the deceased individual and perhaps reconstruct some of the circumstances surrounding death. The fundamental techniques and capabilities of physical anthropology are well covered in the classic texts of the field: Bass (1987b), Krogman and Iscan (1986), and Stewart (1979). The forensic anthropologist commonly becomes involved in a case when the body has become partially or completely skeletonized. The skeleton is the most durable system of the body and is available long after the rest is gone.

Physical anthropologists first carefully describe the condition of all remains brought to them, including an inventory of the bones present. From this inventory, they can determine the minimum number of individuals represented, thus determining possible commingling of remains. They can also make a species determination, separating human from animal bones (Brues, 1958).

Presuming a reasonably complete recovery of the skeleton, a physical anthropologist can usually determine the "Big Four" about the deceased: stature, age at death, sex, and racial stock or affiliation (Krogman & Iscan, 1986). The estimation of stature is based upon measurement of the long bones of the body and subsequent calculations based on the maturation and then degeneration of the human skeleton over time. The bones mature and grow until the twenties and then begin irreversible degeneration. This pattern of change with age, though subject to wide variation among individuals, is well known (Bass, 1987a).

If the deceased was an adult, the probable sex can be determined

by examination of the pelvis, skull, and other bones. The skeletal differences between male and female generally become apparent after the age of 12 to 15 years. Racial affiliation is based upon statistical differences in skeletal features between the major racial groups. There are a host of problems involved in racial determination, among which is admixture, or the mixing of racial traits. The skeletal definition of racial type may also not correspond with social definitions, i.e., bone shape is not always correlated with skin color. Another difficulty is the basic nature of human variation; that there is often more variation in the skeleton *within* a racial type than there is *between* racial groups (France, 1998).

The anthropologist, after the examination of the remains is completed, may be able to provide “necessary information” to investigators (Krogman & Iscan, 1986). This accessory information may include the approximate time since death or time of burial. He may also be able to describe the cause or manner of death if it is registered in the bones. The anthropologist will also describe individualities or anomalies in the skeleton which may assist in the identification of the deceased. These may include pathologies and the remnants of orthopedic injuries. The identification of the deceased can often be made when the conventional identification techniques based on soft tissues, such as facial recognition or fingerprints, are no longer possible. Methods of identification used by anthropologists include facial reconstruction, photographic superimposition, and comparison of the skeleton with antemortem medical and dental records. A guidebook (Pickering & Bachman, 1997) to the the use of forensic anthropology is available to assist in handling cases involving skeletonized remains.

FORENSIC ARCHAEOLOGY

Archaeology, another subfield of anthropology, also has direct applications to law enforcement and other legal problems (Hunter, Roberts, & Martin, 1996). Criminalists can learn from archaeologists, as it is the business of archaeology to detect and recover evidence. Archaeologists, like criminalists, are concerned with ecofacts, which are natural objects with no evidence of human use, such as soils, pollen, plants, and animal bones. They are also interested in artifacts, which are objects of human manufacture and use (Eddy, 1984). In