



## LJMU Research Online

**Borrini, M**

**Forensic Anthropology: a typical Italian case report to understand possible future developments.**

<http://researchonline.ljmu.ac.uk/id/eprint/1621/>

### Article

**Citation** (please note it is advisable to refer to the publisher's version if you intend to cite from this work)

**Borrini, M (2011) Forensic Anthropology: a typical Italian case report to understand possible future developments. Archivio Per l'antropologia e la Etnologia, CXLI. ISSN 0373-3009**

LJMU has developed **LJMU Research Online** for users to access the research output of the University more effectively. Copyright © and Moral Rights for the papers on this site are retained by the individual authors and/or other copyright owners. Users may download and/or print one copy of any article(s) in LJMU Research Online to facilitate their private study or for non-commercial research. You may not engage in further distribution of the material or use it for any profit-making activities or any commercial gain.

The version presented here may differ from the published version or from the version of the record. Please see the repository URL above for details on accessing the published version and note that access may require a subscription.

For more information please contact [researchonline@ljmu.ac.uk](mailto:researchonline@ljmu.ac.uk)

<http://researchonline.ljmu.ac.uk/>

## Forensic Anthropology: a typical Italian case report to understand possible future developments

MATTEO BORRINI\*

PAROLE CHIAVE: antropologo forense, osteobiografia, resti archeologici, identificazione scheletrica, soldati dispersi in azione.

RIASSUNTO — In Italia il coinvolgimento dell'antropologo forense nei casi investigativi si presenta ancora come un fatto piuttosto eccezionale. Tre casi illustreranno i contesti più tipici in cui si esplica l'attività dell'antropologo forense in Italia: ossa umane che emergono dal suolo; un cadavere sconosciuto rinvenuto all'aperto in avanzato stato di decomposizione; l'identificazione di resti ossei pertinenti a soldati della Seconda Guerra Mondiale recuperati sul luogo del conflitto. Eccetto poche eccezioni, scheletri non identificati, corpi in avanzato stato di putrefazione e resti di dispersi in azione durante gli ultimi avvenimenti bellici rappresentano i soggetti più comuni dell'indagine forense nel nostro Paese; l'esperienza internazionale, però, suggerisce ulteriori campi applicativi per le tecniche archeologiche ed antropologiche, incrementando la collaborazione tra medici legali, Procura della Repubblica e antropologi nell'ottica di un poliedrico e più completo team investigativo.

KEY WORDS: forensic anthropologist, osteobiography, archeological remains, skeletal identification, missing in action.

SUMMARY — In Italy is still quite uncommon that a forensic anthropologist is involved in investigative cases. Three typical cases are illustrated to demonstrate anthropological investigations conducted in Italy: human bones emerging from soil; an unidentified, badly decomposed body from an outdoor scene; The skeletons of WWII soldiers recovered from a battlefield and processed for identification. Despite a few exceptions, unidentified skeletons, badly preserved bodies, and the presence of unrecovered soldiers from the last world war are the most common subject for anthropological investigations in Italy; but the international experience suggests further fields for the application of anthropological and archaeological techniques, improving the collaboration between pathologists, State Prosecutor Offices and anthropologists to create a more complete investigative team.

### INTRODUCTION

I had the honor to present an invited lecture during the BIT's 2nd Annual World Congress of Forensics, that took place in Chongqing (China) the 15<sup>th</sup> until the 18<sup>th</sup> of October 2011 focusing on the Theme "Science, Justice and Peace".

It was an opportunity to present three different cases of how the involvement of the forensic anthropologist in investigative cases is a practice still quite uncom-

\* University of Florence, Museo Fiorentino di Preistoria (via S. Egidio 21, Firenze).

mon in Italy. Usually anthropologists in Italy are called as auxiliaries of medical examiners and pathologists when skeletonized human remains are found.

The following considerations are presented in hope of future developments.

## MATERIAL AND METHODS

### *case #1*

A group of teenagers brought a human mandible and other bones fragments to the local Police Office. They claimed to have found the remains in an open field near the promontory that forms the entrance to the Gulf of the city.

The police officers became suspicious due to the young people's ambiguous behavior and outlandish attire which consisted of black metal group T-shirts. The Carabinieri asked the Prosecutor to involve an anthropologist. The aim of the investigation was to locate any other human remains on the site and also determine their origin. In fact, it was necessary to clarify if the young people were making a bad joke at the expense of the police officers. In that case it would be a criminal offense of possibly desecrating a cemetery (Art. 408 and 410 Italian Penal Code) and creating alarm (Art. 658 Italian Penal Code). The alternate explanation was that they were in good faith and there actually were remains hidden in the area. In this last case the post-mortem interval and identities needed to be ascertained.

After a survey of the scene some concentrations of protruding bones, consisting mainly of small fragments with traces of weathering, and isolated teeth were found. It was planned to open some stratigraphic tests for the nature of the bone outcrops and for the presence of hidden bodies. In the concentrations of fragments articulated individuals were found, including an infant and some disarticulated bone. Based on these pieces of evidence the forensic anthropologist (Borrini, 2008) was able to exclude the charge of "procured alarm" and "defamation of a corpse" against the boys.

At this point, it was necessary for the Prosecutor to clarify the post-mortem interval and the origin of the bodies. The examination of the stratigraphic seriation carried out *in situ* using an archaeo-anthropological approach, combined with the analysis of taphonomic artifacts on bones (such as bleaching from surface exposure, soil adhesions and soil staining) and the estimation of the minimum number of individuals (17 subjects, both males and females and 9 infants were recognized) in different age groups, a determination that the remains were part of a historical cemetery without forensic interest.

### *case #2*

The second his case also concerned completely skeletonized remains, but this time they had a definite judiciary interest. They belonged, in fact, to soldiers

“missing in action” during the Second World War. On Italian soil there were around 90,000 allied troops (Blaxland, 1979), 215,000 Germans and Italians (Jackson, 2009) that had died; it follows that although most of them have been recovered in the immediacy of the conflict and buried in the military and civilians cemetery, the Italian soil still contains a huge number of unknown corpses. It is not uncommon that these remains are discovered for accidental reasons or after the declaration of older survivors, which are generally issued on the death-bed. While no action is brought against anyone relating to the fallen, except in the case of war crimes, the Court is still interested in the identification of these bodies and the restitution to their families.

For the case illustrated here the forensic anthropologist was involved for the recovery of the bodies, which were in a Cave. Elderly witnesses have reported that were an unknown number of soldiers, theoretically Nazis, thrown into a deep karst cavities during the last days of the war. The cavity was formed by an enormous sinkhole about 70 meters deep on the bottom of which lay a room of 2000 square meters. Recovery operations, which required the intervention of a fire brigade to support the descent of the anthropologist, have been complicated by the presence of a large amount of debris and trash thrown in over the years. This detritus may also have been used to better conceal the remains of reprisal victims. In addition, due to the presence of sinking sewage and the illegal disposal of carcasses of some animals, which had died of tetanus, the use of high risk personal protective equipment for the protection not only of the crime scene, but also of the operator was necessary.

It is important to note that in this situation, the anthropologist was forced to intervene in a “hot zone” (Drielak, 2004) not only with biological risk, but also high-risk physical danger due to both the nature of the scene, in a deep cave, and also by the presence of unexploded ordnances. For this reason, the operator was supported by the bomb disposal unit of the Carabinieri.

In this case the contribution of the anthropologist was essential for the recovery of the remains and for their identification, The anthropologist was also needed for the reconstruction of the causes of death: In one case a sacrum a ricochet bullet was found, which had fallen from the spinal canal as a bounce (Ferrugia et al., 2010). Other preliminary analysis were conducted on entomological evidence recovered these remains to estimate the season during which the death accursed (Turchetto et al., 2008). This case demonstrated how important it is to work in a multidisciplinary framework for a complete reconstruction of past criminal events.

### *case #3*

The third case was also of forensic interest and regards the identification of a person whose badly decomposed body was recovered in an outdoor crime scene. Initially, two skull fragments were recovered in a pit of filtered water from a stream flowing into a small wooded gorge. Not won over by the species diagnosis

made by a veterinary surgeon and a radiologist, who were unsure of the animal nature of the bones, the Prosecutor hired the forensic anthropologist. Once it was established that they were human remains, lines of research for the rest of the body were organized. Despite the dense vegetation, which made the operations particularly difficult, dismembered remains of a saponified individual were found in the riverbed after several days of patrolling the woods conducted using a surveying technique (Borrini, 2007a) and taking into consideration the possible dispersal area (Manhein et al., 2006).

Morphometric analysis of the remains took place with the aid of the software FORDISC (Ousley and Jantz, 2005) to provide the biological profile of the person who was then compared to a list of missing persons in the area. For the recoding of measurements, a new forensic protocol (Borrini, 2011) based on the Martin and Saller's traditional method (1957/66) was used to guarantee the relevance, reliability and validity of data (Bono, 2011).

The estimated post-mortem interval, based on cadaveric changes and adipocere formation with *cute anserina* (O'Brien and Kuehner A.C, 2007; Mant and Furbank, 1957) allowed the field of potential persons for identity to be narrowed further. To better restrict the time since death, according to the environment condition necessary for the corpse's modification (Mellen et al., 1993), temperature and precipitation data were obtained from the two closest meteorological stations for the three previous years. Also the degree of deterioration of the clothes associated with the remains (Morse and Dailey, 1985) was evaluated.

After individualization of a "suspects of identity", a missing person with a biological profile and time since disappearance compatible with the TST estimated from the remains, two strategies were possible in order to verify the identification: a comparison between the genetic material extracted from the remains and a sample from the son of the missing, or an osteobiographic comparison.

The genetic solution was likely to be longer and more difficult due to the waterlogged environment; for that reason an osteo-biographic comparison was chosen.

Outcomes of a surgical operation on the elbow were identified in the remains, but this evidence was not sufficient for the identification, because only a generic description of this was made by the missing person's family at the time of disappearance. The anthropological observation, however, also noted a fusion of the thoracic vertebrae, from the third to the 12<sup>th</sup> with osteophytic proliferation spread throughout the rest of the postcranial skeleton. A clinical picture of DISH Diffuse idiopathic skeletal due hyperostosis (Colina et al., 2006; Utsinger, 1985), usually more present in male older than 75 years (Kiss et al., 2002) as the undefined subject, have been detected.

Although not diagnostic on the missing subject, the comparison with x-rays done during life for other purposes allowed a perfect overlap of the vertebral defects: defects with unique morphology, in agreement with the literature (Kahana and Hiss, 1994; Brogdon, 1998; Mundorff et al., 2006; Simpson et al., 2007;

Scott et al., 2010; Watamaniuk and Rogers, 2010). This evidence allowed a reliable personal identification. In this way, it was possible to identify the subject by the osteobiographic approach with certainty, drastically reducing the time and cost of the investigation. In addition, the identification of DISH by the anthropologist has also identified the probable cause of death: a greater fragility of the spine and preexisting spinal rigidity that, prompted by a fall that left fractures on ribs, had caused a spinal cord injury (Asser et al., 2010).

## RESULTS AND DISCUSSION

The three cases presented have been used to demonstrate that except for a few exceptions, unidentified skeletons, badly preserved bodies, and the presence of unrecovered soldiers from the last world war are the most common subjects for anthropological investigations in Italy. Unfortunately, our national situation seems to appear backward if compared to that in other countries. There is clearly room to develop the forensic anthropology field in Italy, especially in skeletal anthropology.

First of all it is important to understand that the role of a forensic anthropologist is not limited to identification purposes, when a completely skeletonized or badly decomposed bodies are found.

It is true that in Italy, pathologists use radiological imaging for age assessment also on living persons to establish the criminal responsibility in cases involving potential minors without identification papers (i.e. illegal immigrants or nomadic groups), but as the investigation is carried out as a medical practice, it is difficult to imagine that it could be entrusted to non-medical personnel.

But if we exclude, perhaps not so correctly, the involvement of the anthropologist in this field, we can look to the rest of the World to understand the potential of forensic anthropology. Forensic anthropology, indeed, is not only forensic anatomy, but it's also a complex discipline that can aid investigators to solve crimes. The skeletal system, in fact, is often involved in violent death, from a fatal car accident to a murder, and it registers a significant amount of information.

Steve Symes defines a bone trauma as a "*Moment Frozen in Time*" (2005). Indeed, sometimes it is better to look at the bones to understand the dynamics that create a wound. For the Italian context, this was seen for the soldier examination (*case #2*), and sometimes it also happens when badly decomposed bodies are processed (*case #3*): every time that a bone is involved in a wound an anthropologist should be involved in the case. This also holds true for really fresh corpses or in living individuals when radiological images are performed. These cases should be evaluated by a radiologist and an anthropologist.

The knowledge of skeletal biomechanics (Evans, 1958; Harkess et al., 1975; Keaveny et al., 1994; Galloway, 1999; Trencce, 2001) can help the medicolegal examination for a more complete investigation of violent death (Smith et

al., 2003). For example, to establish the direction of a gunshot wound or the point and direction of a force applied to fracture the bone (Berryman and Symes, 1998), or to determine from the cut marks the kind of blade used during a fatal assault or a corpse dismemberment. It is known that the soft tissues are elastic and subject to modification even in the short time after death, so they do not always perfectly retain the original morphology of the weapon. For this reason it would be desirable to have a greater involvement of forensic anthropologists in autopsies where it could be possible to detect bone injuries; if someone may object that anthropologists are not pathologists, the answer is that anthropologists must respond to different questions, integrating medicolegal observations with additional data for a faster response to answer the call of Justice.

Another relevant aspect linked to forensic anthropology is the application of archeological techniques at the scene (Borrini, 2007b).

The most relevant aspect of archeological research is the graphic documentation of each piece of evidence in the excavation; this peculiarity can be moved into the forensic context to map each element on the scene. Especially on large scale scene such as mass fatalities.

The experience in the U.S. of 9\11 (Gould, 2002) or the Colgan Air Flight 3407 (Dirkmaat, 2009; Dirkmaat, 2010; Dirkmaat et al., 2011) plane crash in Clarence, just to quote two of the most remarkable examples for the anthropology community, teach us that anthropologists on the scene are essential to maximize data collection

The map of the bodies recovered at Ground Zero was realized by a typical archeological approach; and some anthropologists of the Mercyhurst College of Erie (Pennsylvania) were involved for debris removing on the plane crash scene by stratigraphic approach, to retrieving and then identifying the passengers.

In Italy, except for some rare cases such as the Linate air crash on October 8th, 2001 (Piccinini et al., 2004) or the Shipwreck of the Albanian ship Kater in the Adriatic Sea the 13<sup>th</sup> of March 1997 (Campobasso et al., 2006), anthropologists are hardly ever involved at the disaster scene. There are very strict rules as to the personnel authorized for the intervention (usually military, Civil Protection or pathologists), combined with the misunderstanding of the potential of anthropology, make the entry of this professional difficult in these delicate scenarios.

No anthropologists were at the scene of the L'Aquila earthquake where it could have been possible to recover not so much the victims but to more accurately collect and document pieces of evidence related to possible sub-standard buildings that withstand earthquakes. The 9\11 example of mapping and recovery teaches us that this could be possible by an anthropological approach.

No anthropologist had been involved in the investigation of the Viareggio train disaster of 30<sup>th</sup> June 2009 when the explosion of a wagon for transportation of LPG destroyed several buildings. The collapse of one building killed a man, and after a week of non-systematic research only a portion of the body, his knee, was recovered. The anthropologist's intervention would provide a stratigraphic

removal of debris with the option of returning the body to the family, not only a few grams of it. Look back at how successful anthropologists were at this at the Buffalo plane crash.

Also the contribution of taphonomy should not be forgotten. We have seen in the case of the ancient cemetery (case #1) that contextual taphonomy (Borrini et al., 2011; Borrini and Tumbarello, 2011) helps to define the environment in which a bone was preserved. Using well known examples: soil adhesion and staining define a burial, and surface erosion and weathering allows us assume an outdoors scene.

On the other hand, the depositional taphonomy, another branch of taphonomy, allows us to determine by the bones' position (Duday, 2005; Mallegni and Rubini, 1994) and the postmortem movements of the concealment modes (grave in the ground or burial in a perishable container) and the status of the victim (buried naked or dressed, cadaver moved during or after decomposition).

Recent Italian cases involving the search for bodies of young missing girls have also shown the urgent need to involve experienced staff in the survey. As for the Yara Gambirasio case, no search for missing bodies, including those using Ground Penetrating Radar and cadaver dogs, would be complete if it does not involve the forensic anthropologist, who, thanks to the knowledge of the archaeological survey, is able to plan and prioritize the research, exhaustively reading the evidence on the ground.

## CONCLUSIONS

After this case reports, it appears clear that an improvement of the collaboration between pathologists, State Prosecutor Offices and anthropologists can create a more complete investigation team that can answer to the needs of justice with more accuracy, validity and reliability.

Moreover, this team could be employed not only in national investigations but also offered to the international community when mass fatalities occur such as the recent Japanese tsunami.

Only by overcoming the distrust of an expert who handles the corpse who is not a pathologist (a very diffused suspicion in Italy) we can take full advantage of the potential offered by a professional like the forensic anthropologist; a well-known figure in the international context, especially in England and United State of America.

It is important to understand that forensic anthropology is not limited to forensic anatomy, and therefore only the identification, as it is essential to understand that the archaeological techniques can not only be applied to the ancient remains, but they can be transposed to modern crime scenes.

The *modus operandi* of the archaeologist and investigator is the same (Gardner and Bevel, 2009): small material evidence is used to reconstruct past events. And the great contribution of archeology lies in the ability to document, preserve and

reconstruct by mapping the original aspects of crime scene, the status quo ante the crime scenes operators intervention, to better reconstruct crime-dynamics.

It is also not useless to clarify one more point about the anthropological based identification often viewed with wariness in our Country because it is apparently in competition with genetic analysis.

Bone and DNA are not enemies: the anthropologist in fact prepares the way for the geneticist to screen the list of missing persons thanks to the biological profile data, allowing the selection of a small number of subjects to be tested by DNA analysis. However, in cases where DNA extraction is particularly compromised due to the condition and preservation of the body, an osteobiographic identification remains the only valid means of identification.

Corresponding author: [matteo.borrini@gmail.com](mailto:matteo.borrini@gmail.com)

#### REFERENCES

- Asser, H., Thomsen, A.H., Jurik, A.G., Uhrenholt, L., Vesterby, A. (2010) Traumatic Death in Ankylosing Spondylitis. *J Forensic Sci*, vol. 55, no. 4.
- Berryman, H.E., Symes, S.A. (1998) Recognizing Gunshot and Blunt Cranial Trauma through Fracture Interpretation. *Forensic Osteology: Advances in the Identification of Human Remains*, edited by K. J. Reichs, pp. 333-352, Charles C. Thomas, Springfield, IL.
- Blaxland, G. (1979) *Alexander's Generals (the Italian Campaign 1944-1945)*. London: William Kimber.
- Bono, J.P. (2011) Past President's Editorial. *J Forensic Sci*, 56: 285-288.
- Borrini, M. (2007a) *Archeologia e Antropologia Identificativa*. *ArcheoVenezia Anno XVII n.1- 2 giugno*
- (2007b) *Archeologia forense. Metodo e tecnica per il recupero dei resti umani: compendio per l'investigazione scientifica*. Bologna: Editrice "Lo Scarabeo".
- Borrini, M., Mariani, P.P., Murgia, C., Rodriguez, C., Tumbarello, M.V. (2011) Tafonomia giacitura: le alterazioni superficiali dell'osso come indicatori contestuali. In M. Micheletti Cremasco and Scalfari F. (editors) *Quaderni di Asti Studi Superiori Vol. 2 "XIX Congresso dell'Associazione Antropologica Italiana"*.
- Borrini, M., Tumbarello, M.V. (2011) *Taphonomy Reader Beta-Version: A Software to Help in Taphonomic Syndromes Diagnosis*. *Proceedings of the American Academy of Forensic Sciences, Annual Scientific Meeting Chicago*, vol. 17.
- Brogdon, B.G. (1998) Radiological identification of human remain. In Brogdon BG, editor. *Forensic radiology*, Boca Raton, FL, CRC Press, pp.149-87.
- Campobasso, C., Di Vella, G., De Donno, A., Santoro, V., Favia, G., Introna, F. (2006) Pink Teeth in a Series of Bodies Recovered From a Single Shipwreck. *American Journal of Forensic Medicine & Pathology*, 27, Issue 4: 313-316.
- Colina, M., Covoni, M., De Leonardi, F., Trotta, F. (2006) La iperostosi scheletrica idiopatica diffusa (D.I.S.H.). *Reumatismo*, 58(2): 104-111.
- Dirkmaat, D.C. (2009) Forensic archaeological documentation and recovery of the victims of the Continental Connection Flight 3407 crash in Clarence, NY. *The 43rd Annual Meeting of the National Association of Medical Examiner*, San Francisco CA.
- Dirkmaat, D.C., Cabo-Pérez, L.L., Kenyhercz, M.W., Nesbitt, A.M., Klales, A.R., Chapman, E. (2011) Improving Evidence and Victim Recovery Protocols at the Mass Fatality Incident. *Proceedings 63rd Annual Meeting of American Academy of forensic Sciences*, Chicago, vol. 17.
- Dirkmaat, D.C., Symes S.A., Cabo L.L. (2010) Forensic archaeological recovery of the victims of the Continental Connection Flight 3407 in Clarence Center, NY. In *Proceedings 62nd Annual Meeting of American Academy of forensic Sciences*, Chicago, vol. 16.

- Drielak, S.C. (2004) *Hot Zone Forensics: Chemical, Biological, and Radiological Evidence Collection*. Springfield, Illinois: Charles C Thomas Pub Ltd.
- Duday, H. (2005) *Lezioni di Archeotanatologia (archeologia funeraria e archeologia di campo)*. Roma: Ed. Erma.
- Evans, F.G. (1958) Relations between the microscopic structure and tensile strength of human bone. *Acta Anatomica*, 35: 285–301.
- Farrugia, A., Raul J., Géraut, A., Ludes, B. (2010) Ricochet of a Bullet in the Spinal Canal: A Case Report and Review of the Literature. *Bullet Migration, J Forensic Sci*, vol. 55, no. 5
- Galloway, A. (1999) The Biomechanics of Fracture Production. In *Broken Bones: Anthropological Analysis of Blunt Force Trauma*, pp. 35-62. Charles C. Thomas, Springfield, IL.
- Gardner, R.M., Bevel, T. (2009) *Practical Crime Scene Analysis and Reconstruction*. Boca Raton: CRC Press.
- Gould, R.A. (2002) WTC archaeology: what we saw, what we learned, and what we did about it. *SAA archaeological record*, vol. 2, no. 5.
- Harkess, J.W., Ramsey, W.C., Ahmadi B. (1975) Principles of fractures and dislocations. In: Rockwood CA, Green DP, Eds. *Fractures in adults*, 2nd ed., Philadelphia: J.B. Lippincott Company, 1: 1-146.
- Jackson, W. (2009) *The Mediterranean and Middle East*. Uckfield, UK: Naval & Military Press, vol. 6.
- Kahana, T., Hiss, J. (1994) Positive identification by means of trabecular bone pattern comparison. *J Forensic Sci*, 39: 1325-30.
- Keaveny, T.M., Guo, X.E., Wachtel, E.F., McMahon, T.A., Hayes, W.C. (1994) Trabecular bone exhibits fully linear elastic behavior and yields at low strains. *J Biomechanics*, 27(9): 1127–36.
- Kiss, C., O'Neill, T.W., Mituszova, M., Szilagy, M., Poor, G., Scand, J. (2002) Prevalence of diffuse idiopathic skeletal hyperostosis in Budapest, Hungary. *Rheumatol.*, 31: 226-229.
- Mallegni, F., Rubini, M. (edited by) (1994) *Recupero dei materiali scheletrici umani in archeologia*. Roma: CISU.
- Manhein, M.H., Listi, G.A., Leitner, M. (2006) The Application of Geographic Information Systems and Spatial Analysis to Assess Dumped and Subsequently Scattered Human Remains. *J Forensic Sci*, May, vol. 51, no. 3.
- Mant, A.K., Furbank, R. (1957) Adipocere - A Review. *Journal of Forensic Medicine*, 4, no. 1: 18-35.
- Martin, R., Saller, K. (1957-66) *Lehrbuch der Anthropologie*. Stuttgart: Fischer Verlag.
- Mellen, P.F.M., Lowry, M.A., Micozzi, M.S. (1993) Experimental Observations on Adipocere Formation. *Journal of Forensic Sciences*, January, 38, no.1: 91-93.
- Morse, D. and Dailey, R.C. (1985) The Degree of Deterioration of Associated Death Scene Material. *Journal of Forensic Sciences*, JFSCA, Jan., 30, no.1: 119-127.
- Mundorff, A.Z., Vidoli, G., Melinek, J. (2006) Anthropological and radiographic comparison of vertebrae for identification of decomposed human remains. *J Forensic Sci*, 51(5): 1002-4.
- O'Brien, T.G., Kuehner, A.C. (2007) Waxing Grave About Adipocere: Soft Tissue Change in an Aquatic Context. *J Forensic Sci*, March, vol. 52, no. 2.
- Ousley, S.D., and Jantz, R.L. (2005) *FORDISC 3.0: Personal Computer Forensic Discriminant Functions*. University of Tennessee.
- Piccinini, A., Betti, F., Capra, M., Cattaneo, C. (2004) The identification of the victims of the Linate air crash by DNA analysis. *International Congress Series* 1261: 39-41.
- Scott, A.L., Derek Congram, D., Sweet, O.C.D., Fonseca, S., Skinner, M. (2010) Anthropological and Radiographic Comparison of Antemortem Surgical Records for Identification of Skeletal Remains, *Journal of Forensic Sciences*, 55 (1): 241-244.
- Simpson, E.K., James, R.A., Eitzen, A.D., Byard, R.W. (2007) Role of Orthopedic Implants and Bone Morphology in the Identification of Human Remains. *J Forensic Sci*, 52 (2): 442-448.
- Smith, O.C., Pope, E.J. and Symes, S.A. (2003) Look Until You See: Identification of Trauma in Skeletal Material. In *Hard Evidence: Case Studies in Forensic Anthropology*, edited by D. W. Steadman, pp. 138-154. Pearson Education Inc., New Jersey.
- Symes, S.A. (2005) What is the Future of Forensic Anthropology?. . . Assuming there is One?, (Handout) Mercyhurst Archaeological Institute, Department of Applied Forensic Sciences, Mercyhurst College, Erie, PA.
- Trence, AT. (2001) Biomechanics of fractures and fixation. In Bucholz RW, Heckman JD, Eds. *Rockwood and Green's fractures in adults*, Philadelphia: Lippincott, Williams and Wilkins, 1: 1-36.

- Turchetto, M., Lafisca, A., Borrini, M., Vanin, S. (2008) A study of the entomofauna on some 2nd world war skeletons from a "foiba" in NW-Italy. Atti del Convegno EAFE European Association of Forensic Entomology 2008.
- Utsinger, P.D. (1985) Diffuse idiopathic skeletal hyperostosis. Clin Rheum Dis, 11: 274-9.
- Watamaniuk, L., Rogers, T. (2010) Positive Personal Identification of Human Remains Based on Thoracic Vertebral Margin Morphology. Journal of Forensic Sciences, 55 (5): 1162-1170.