

Effective Application of Science to the Accounting Process

Thank you so much for the opportunity to offer my thoughts on this important topic of the *Effective Application of Science to the Accounting Process*. Having worked at CILHI during the 1990s up until 2002, and then working alongside law enforcement and medical examiner's teams since that time, I have gained a broad view of the process of recovery and identification in both the military and civilian contexts. I have also seen – especially within the last decade -- a national, even global, *push to improve* standards of basic criminal and civil investigations, accounting, and identifications.

For example, I have seen the medical examiner's office with which I consult expand its jurisdiction recently – this is a national trend. The medical examiners' offices in the United States have been increasing their own jurisdictions -- while coroners' domains are shrinking -- in the last decade, since there has been movement throughout the country *for a higher scientific standard to be applied to death investigations*. A medical examiner is by definition a medical doctor and the scientific expert whose responsibility it is to sign the death certificate within his/her jurisdiction, whereas a *coroner* is an elected official *who may or may not be a medical doctor*. The implication of the ME system expansion is that the medically trained expert is preferable to render the final opinion on matters of death.

The push to include *more rigorous science*, along with more scientific expertise, in the process of investigating deaths and accounting for missing persons appears in other areas in the U.S. The National Academy of Sciences 2009 Report on the state of forensic science is one example. The upshot of this report was that practitioners of forensic science

and the labs in which they work *have room for much improvement*. Some of the areas in need of attention according to the report are (1) the need for quantifiable data, (2) the ability to report error rates of methods used, and (3) the standardization of terms used.

On the larger international scene, the increased expectation of effective science has also appeared in organizations that carry out identification/accounting. Such agencies have appeared in the past two to three decades and now serve as examples, e.g. the International Commission on Missing Persons (ICMP). ICMP is an inter-governmental agency that was begun at the request of President Bill Clinton in 1996 at the G7 Summit in Lyon, France. This was a response to reports of tens of thousands of missing persons resulting from conflicts in Bosnia and Herzegovina, Croatia, and Yugoslavia (1991-1995). ICMP uses what it calls a “rule of law” approach to identification, which treats all cases with **a legal standard** of evidence handling, testing, and reporting. More recently, ICMP worked with INTERPOL to develop a protocol outlining the use of scientific techniques in identifications occurring from mass disasters (2009). These international agencies strive to use science effectively in the process of investigation of deaths from disasters and conflicts worldwide.

With that theme of the use of more effective and rigorous science in the investigation/identification process, let’s review the steps of the investigation process, compare approaches, and then see where improvements can be, and perhaps are being, made.

So where do we start?

I teach future police officers a course called “Investigations”. Thus, I would like to start with the basics -- using the process of general investigations as used by most law enforcement agencies (national and international) for practical purposes. How does an investigation begin?

{SLIDE – side by side comparison will result}

It has to begin with (1) **Information** [*] of some kind. The source may be a person(s), an observation, or in the context of MIA/POW accounting, another government. *It is important to point out here that SCIENCE is NOT part of the process at this initial step. It is human intelligence, historical analysis, observations made by experienced investigators on the ground, etc. that come into play at the inception point. Thus, one take away today is that SCIENCE is just one PART of the Investigation/Accounting Process.*

Once the information reaches the investigating unit, the wheels are in motion to respond, hopefully in a timely fashion – as timely as possible, even in a cold case situation.

Thus, the next step is **(2) the Initial Response (*)** of the investigation unit. The unit can now bring in the specialists that are required to make sense of the information and verify it. The intelligence analysis will inform us as to the basic facts of the case and screen whether the information is valid and reliable, and should be acted on. This has been the traditional role of the Investigative Element (IE) in the accounting process used by JPAC today and JTF-FA in the past. Time is of the essence at this juncture, since as time passes, valuable information continues to be lost.

If the information from the person(s), observation, or another government is deemed to be sound then the **(3) Follow-up Investigation** {*} can now begin. In a criminal investigation, this is when a detective(s) will be used as well as crime scene investigators, or criminalists will use their systematic methods to collect evidence and transport it back to the laboratory. Here is where the application of scientific methods begin to be incorporated into the process. {With the U.S. accounting process it would be this time that an Recovery Element would come in to excavate the site.} At this point in the investigation/accounting process, we have many team members who may get involved – this is where *the multidisciplinary approach* should be used to its maximum capacity.

The final step of the process is termed “Reconciliation” – where the information gathered in the previous phases is brought together. In a criminal investigation, this is when the witness statements, scene evidence, and tests done on such evidence will be brought together to bring a case to court. In the full accounting process, this is where the case file is reviewed to see if there is agreement between history, human intelligence, physical evidence, and tests done on evidence. If conformity is observed in the various strands of evidence and background information, then this will be reported as a reconciled, scientific identification.

You can see as other investigation/accounting agencies are presented alongside the basic published investigation techniques, that the process looks roughly the same.

Compare JPAC, (1. Historical research analysis, 2. Archaeological analysis, 3. Forensic Anthropology and Forensic Odontology, 4. DNA Analysis (as needed), 5. Reconciliation) ; then Committee on Missing Persons -Cyprus (under the auspices of the UN) (1.

Archaeological, 2. Anthropological, 3. Genetic, 4. Reconciliation); then Spanish Civil War investigations (1. Interviews/Written Records, 2. Antemortem Data, 3. Archaeological/Osteological, 4. Targeted DNA typing, 5. Reconciliation/Identification); then ICMP (1. Intelligence gathering, 2. Initial Response (previsit), 3. Exhumation, 4. DNA sampling (100%), Traditional Personal Info Collected (Anthropology), 5. Reconciliation); then INTERPOL 's Disaster Victim Identification Guide (2009): (1. Recovery and Evidence Collection, 2. Identification a. Primary identification methods – most reliable and scientifically sound , i. Fingerprint analysis ii Comparative dental analysis iii. DNA analysis. b. Secondary identification methods – Not *ordinarily* sufficient as the sole means of identification, i. Personal description - anthropology, ii. Medical findings – anthropology, iii. Clothing found on body. 4. Ante Mortem Data Collection , 5. Post Mortem Data Collection 6. Reconciliation – Identification).

If we return to the FOLLOW UP PHASE of these investigating/accounting processes – where the science is really happening -- we can see where “tweaks” have been or could be made to apply science effectively.

First, evidence comes from a SCENE. An important factor to keep in mind is throughout all of this there must be proper treatment of evidence items that are collected at the scene – be it a burial site or a crash site, crime scene, etc. – without the appropriate chain of custody, protection of the scene during the recovery/evidence collection phase, we have nothing. The value and integrity of evidence can be jeopardized if the treatment of

items at the scene is not carried out systematically and methodically – e.g. , scientifically. As the now-famous defense attorney, Barry Scheck stated back in the days of the O.J. Simpson trial, “Garbage in – Garbage out” – if you put garbage into a laboratory, garbage will come out.

At the scene, we must ensure that the archaeologically-trained experts will employ a systematic approach to collecting the evidence so that it can be mapped as it is located, photographed, bagged and tagged. Dr. Leney has already emphasized the importance of high standards being maintained here. Methods to map scenes/sites have advanced so that now a GPS unit, computer and survey instrument are combined into one machine – the total station, making mapping and reconstruction of a site more quick, efficient, and precise. Examples of the effective use of the total station in the recovery and identification of victims in large mass graves from Bosnia-Herzegovina (1990s) and the Colgan aircraft crash in Clarence, NY (2009) show us how effective use of technology and trained experts begin in the initial, field stages of the investigation process. **The high percentage of positive identifications that resulted from both of these complex field contexts is no doubt linked to the precise field methods used from the start.**

Once evidence items are properly transferred to the forensic science unit, the multidisciplinary team can respond with its variety of skills to apply to the particular evidence type. With the evolution of new technologies and techniques, the specialties available to the forensic science laboratory will no doubt continue to grow and diversify. It is the duty of the lab directors/administrators to keep abreast of these new technologies and

techniques so that their use may be included in case resolution, once the science has been validated and deemed reliable through rigorous testing.

An excellent example of a technique that has evolved to be considered the “gold standard” for forensic science specialties is, of course, DNA, which has just been discussed by Dr. Reedy. The NAS report (2009) holds DNA up as the model, exemplary evidence type with its ability to be replicated and validated. Used infrequently until the 1990s, now it is the “go-to” evidence type if available. Even its “availability” has become a relative term due to its evolution in the lab setting – with refined methods of detection making it available for even what once would be considered a sample of bone or other biological material that was “too small”. Without DNA capability today, an accounting/identification effort would be untenable and a “non starter.” As you have seen in the comparative slide, efforts to identify missing persons from various conflicts worldwide always include DNA testing,

What of the other scientific specialties that can be applied to the accounting/identification process? Along with DNA, what other means are used to make a positive identification? Is it possible that DNA is not always the answer? Yes, in some cases, DNA may not be as helpful as hoped. For example, in the case of the genocide in Rwanda that occurred in the 1990s, the use of DNA was made extremely difficult to impossible due to the lack of maternal references available. Entire families were eradicated in these mass killings, thus a body or bodies could produce a DNA sequence, but there was no person available to produce the required “match” sequence. Mitochondrial DNA has limitations as well if the sequence is of a type that is relatively common in the population.

Thus if DNA is not useful or available in a certain context, other “primary identification methods” should be explored. INTERPOL (2009) points to fingerprints and dental analysis as the other “*primary identification methods.*” Clearly the method to be used effectively depends on the context and what is available for testing. Forensic odontologists with their use of ante and post mortem radiographic and chart comparisons, are able to establish a positive identification beyond any reasonable doubt. Likewise, fingerprints, if available can do the same. As we know in the particular context of the accounting for missing in action service members, dental comparisons are much more likely to be used than friction ridge patterns comparisons. Yet, friction ridge patterns were used in a CIL identification in the 1990s when such tissue from the sole of the foot had been preserved in the anaerobic environment until its discovery by the recovery team. The FBI laboratory partnered with the CIL to make this identification. -- This is an excellent example of *the flexibility of the system to accommodate the evidence and remains that are available to the appropriate testing so that an identification can be made, using science that is valid and reliable.*

Where does forensic anthropology sit in this process of effective accounting? As you can see, INTERPOL (2009) places forensic anthropology as a *secondary identification method.* It helps provide “personal description” of and “medical information” for the decedent.

Even more basically, forensic anthropology functions to inventory and sort evidence – sorting skeletal remains *so that only human bone is present* and analyzed further. Thereafter, individual remains can be sorted if there is any *commingling*, so that the

skeletal remains associated with person #1 are not mixed in with the remains of person #2. This can be done qualitatively but metric analyses have been developed so that there is a much more sound scientific basis for this process of determining the *Minimum Number of Individuals*, and sorting out cases where more than one individual is present .

Once individuals are separated in commingled cases, *inventorying* can begin – so that each individual’s total number of skeletal elements are associated together if possible. The forensic anthropologist can then determine the personal descriptive information – or biological profile -- for each individual in the case, producing a report that summarizes what has been observed/established such as sex, age at death, stature, ancestry, and the like.

Yet, as Dr. Leney has been quoted as saying : “...determining that somebody is a 5-foot-10 white male between 20 and 24 years of age isn’t terribly useful...[I]t often doesn’t get you to an identification.” This profile information is valuable in **a *supportive rather than probative sense***. [++++death knell tolls here +++] ☺

Other scientific specialties offer the same type of supportive, circumstantial information to case resolution – e.g., personal effects, clothing items, equipment fragments, etc. These types of evidence and reports generated from them contextualize the case in time/space/vehicle type/general biological information, however **they are not able to confirm an identification in a scientific sense**. Promising methods using radiographs of the frontal sinuses (Christensen 2009) have shown their utility in personal identification, **but this is the exception rather than the rule** in forensic anthropology.

Effective Identification Process of the 21st century– What does it look like?

So, in real and practical terms, how can the application of science be as effective as possible in the investigation/identification process? We have seen that there are some differences between agencies in how this process is approached. JPAC, CMP-Cyprus, and Forensic Teams in Spain use what is called the “humanitarian orientation” by the ICMP (2013). In contrast, ICMP uses the “rule-of-law” approach, as it states it is “working to a standard of evidence required for legal processes...” (ICMP Report 2013). The ICMP Report that resulted from an international meeting held in 2013, goes on to say

“Specific, highly reliable methods have been needed in order to locate and identify the missing. ICMP made a decision to use DNA as the first line of identification in the former Yugoslavia in order to provide scientific accuracy and objectivity in making identifications, and in turn to produce irrefutable evidence about who has gone missing, or who has been killed. The approach has been equally successful in assisting the identification of persons missing as a result of disasters and other causes” (2013; 13).

The stated reason for using this rigorous approach is the fact that the majority of missing persons today are not combatants, but civilians. Thus, more cases are seen as potentially bound for court.

Yet, to paraphrase Queen Noor 's opening remarks of this same conference, it seems that any person who is missing, *no matter the circumstances of their going missing*, is a person who is being missed by others. All persons who are missing someone, turn to the State authorities for answers and for resolution.

I pose the question then -- Don't they all deserve a similar standard of highly reliable methods...to produce irrefutable evidence about who has gone missing or who has been killed? *Just because some cases are not going to court does not mean that the process should be any less valid and reliable, up-to-date, stringent, and objective.*

Using the international "rule of law" processes as our exemplars, we see emphasis on two aspects of accounting: (a) the ability to streamline the information on each case [historical, AM and PM] and (b) the ability to provide irrefutable, positive identification of missing persons.

The first – streamlining of information -- involves the development of a database that can unify information in one place and allow for exchange of information about missing persons, link domestic and international efforts. The development of the **NamUs (National Missing and Unidentified Persons System) database in the U.S.** is a good example of such a multi-user clearinghouse for information. NamUs (www.namus.gov) is a free, internet-based data repository that can be searched by medical examiners, coroners, law enforcement and the general public to help solve missing and unidentified person cases. The NamUs system also automatically performs comparisons when new cases are entered into the system, searching for matches between missing and unidentified persons.

[Another shared database referred to by ICMP (2013) is the “Direct Project” which was developed by the U.S. Department of Health and Human Services.]

The second emphasis of the “rule of law” approach is on the use of “primary identification methods” whenever possible – fingerprints, dental comparison, and DNA as recommended by INTERPOL. If we are taking an approach where anthropology is inventorying and sorting commingling once remains arrive at the laboratory, the protocol would be to take a DNA sample upon arrival , versus waiting and determining whether or not the DNA is “warranted.” This was the approach employed by ICMP, for the Podrinje Identification Project (PIP) where small bone samples were taken, bar coded for anonymity, and sent to a lab for DNA extraction. This 100 percent DNA sampling approach resulted in 70% of the 40,000 individuals missing in the Balkans being identified in 15 years. If you do the math, this is approximately 1850 identifications per year. We must keep in mind that these were more recent deaths and nuclear DNA would have been more widely available, yet the efficiency and effectiveness are undeniable.

A third area which is not specifically emphasized by the ICMP or INTERPOL but is certainly drilled by general investigators is the START of the scene investigation process. A quote from a investigations textbook reads as follows:

“The initial response is crucial to the success of an investigation. Although it is popularly believed that cases are won or lost in court, more cases actually are lost during the first hour of an investigation – the initial response period – than in court” (Hess and Hess Orthmann 2014: 13).

In a cold case situation, when a response is delayed for whatever the reason, the initial response to the scene/site can still have a profound reverberating effect on all of the following scientific applications to the recovered remains and other evidence. ICMP (the PIP) states that excavations are “closely monitored by several agencies, to ensure that they are conducted legally and thoroughly” (Craig 2002). As Dr. Leney has mentioned earlier, oversight on the initial field response will have a positive effect on all that emerges from the recovery efforts.

The fourth and final area where improvement can certainly be made involves the scientific mindset and demeanor and the perception of this mindset/demeanor by the family members and survivors. The various international and national agencies that have produced process SOPs all have the ultimate goal/phase as “Reconciliation,” meaning of course that the historical and intelligence information, ante mortem data and post mortem evidence, tests and results reported are all in agreement with each other to result in a positive identification. Of course some of this work, especially the historical and ante mortem information gathering, will involve family members as they are the all-important stakeholders in the accounting process.

As scientists we are trained to be neutral, objective, and professional in conducting our work, be it in a laboratory or in the field environment. Yet science that is applied to real world problems – such as full accounting – does not occur in a vacuum. It happens in a social and political context, in which there are a number of direct and indirect stakeholders. The applied scientist must always keep in mind that they are part of a larger picture – no matter where they work. An example comes from Rwanda, after the already-cited

genocides of the 1990s. Looking back on the accounting efforts that she witnessed, a family member named Aurore commented on how exhumations and identifications had gone, and what she *would liked to have seen from the scientific teams*:

“They must consult with survivors in the communities where they will work. They must be respectful and handle the bones with both hands. They should have a good heart and clean the bones with care. And they should show their disgust for what has happened here – react to the bad smell and the horrors of what has been done (2012:17).

Aurore, in retrospect, is seeking **more** than objectivity and professionalism, she is seeking understanding, empathy, and compassion from fellow human beings. Scientists can be detached, but can they become so detached that there is a disconnect in cooperation and a breakdown in trust? To reconcile, means to find agreement and conformity. Mutual respect and positive rapport can only facilitate the reconciliation process. The “team” effort should include the NOK and those involved in the initial processes of the investigation as well – the first responders, the interviewers, the historians, etc.

A scientist might say : “How can they help ME?” I’ve got an example: in a Korean War case, a file in the Casualty Data section on a missing serviceman contained the Xerox copy of a letter his mother had written after he had gone missing. She had provided any personal identifying characteristics that might help in identifying him, if his body was found. She mentioned that he had a “wide gap between his two front teeth.” This information actually assisted the odontologists and anthropologists to make a decision to

narrow down the possible individuals that a unidentified set of remains might be. It could not alone identify him, but it helped in the case reconciliation to have this personal descriptive detail from mom.

CONCLUSION:

For an effective application of science to the accounting process today, we must open our eyes and ears to the national push for improved rigor in the forensic science specialties and the international efforts and protocols that have developed with the “rule of law” approach. Although some agencies’ findings are not bound for court, the standard of humanitarian missions should clearly be of the same high quality and high degree of scrutiny for positive and sound scientific identifications. The processes are similar across various agencies starting at intelligence/history gathering → to excavation/recovery → to biological analysis using primary and secondary identification techniques → to reconciliation of all of the evidence. Improvements in the accounting process on the global level should involve the following areas:

1. Use of a shared, multi-user database that includes multiple agencies and stakeholders, with appropriate security protections in place. *NOTE: Science is only part of the investigatory process.* The ability to involve and include information from witnesses/ next of kin/ historians into a single data base would be ideal. An example would be NAMUS .
2. The enhanced scrutiny of the initial scene response (recovery) with oversight to ensure thoroughness and legal standard of quality. Remember that the scene response can make or break all the steps that follow.

3. The use of 100 per cent DNA sampling as a primary identification method, as categorized by INTERPOL, and demonstrated by ICMP. Is having this information at your disposal ever going to hurt?
4. The encouragement of rapport building and mutual respect between stakeholders – via the expanded database as well as increased communication at all levels and during all steps of the process. Rapport and trust will only facilitate reconciliation.

A one-size fits all approach to the accounting process will never work, given the differences in context. Yet attention to rising national and international standards must be paid. We can always learn from others; if we think we know it all, we are finished. Therefore, we must maintain flexibility, adaptability, and a team focus, from start to finish, with the goal of case reconciliation meeting the highest scientific standards – isn't this what anyone missing a person deserves?

