

# Forensic Podiatry: A Subspecialty for the 21st Century?

This once-arcane area of study is rapidly evolving.

BY STEVEN G. SHALOT, DPM



**F**orensic podiatry is the application of sound and researched podiatric knowledge in the context of forensic and mass disaster investigations. It can deal with pedal (foot related) evidence including barefoot impressions and socked impressions, often in blood.”<sup>1</sup>

Could YOU become a forensic podiatrist? All of us remember that day in June 1994, when the Los Angeles Police Dept. chased a white Ford Bronco on the California Freeway, containing whom they believed to be a suicidal O.J. Simpson. The police helicopters whirled overhead, and a procession of at least a dozen radio cars cautiously followed. Simpson’s wife Nicole and her friend, a 24-year-old waiter named Ronald Goldman, were brutally murdered just a few days before, and the police were look-

ing at O.J. as “a person of interest” in the case. The media had a “feeding frenzy,” and this was surely going to go down as the most widely covered homicide case in America since the

evidence. A crucial part of this forensic evidence was going to be bloody footprints: who made them—victim or killer? In order to obtain a solid case from this evidence, a key piece

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Lindbergh Baby kidnapping/murder case in the 1930s.

Since there were no witnesses to the murder, the evidence against any potential suspect was going to be circumstantial and based upon forensic

of the puzzle needed to fit—the shoes that made the prints had to be an exact match to the footprints found at the crime scene.

The FBI brought in a special  
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agent, a footwear examiner to determine the type of shoe and the size from the actual bloody footprints. But the shoes, which were determined to be Bruno Magli's size 12, Lorenzo style, with a Sigla outsole, were never found. Mr. Simpson purchased a pair of Magli's size 12 several weeks earlier, and claimed he was wearing a pair of Reebok's the night of the murders. It is quite possible that if those Magli's were ever found, the verdict in that bizarre case may have been very different indeed.

Fast-forwarding to 2012, forensic podiatry has been showcased in both the television news media and at least two television episodes of the popular Fox Network crime series "Bones," which brought in a forensic podiatrist to help solve a crime. He handled all phases of the forensic examination as it related to the footwear and prints found at the scene. The show "CSI" also featured a forensic podiatrist. In the real world, however, it doesn't work that way; the whole process is rather more intricate.

Forensic criminology is a team effort, and the FBI will make use of a footwear examiner to do the basic identification of the shoe, as in the Simpson case. The forensic podiatrist can then determine gait patterns and pedal characteristics of the suspect—these analyses being, however, only the tip of the iceberg of what the podiatrist can bring to the investigation.

In addition, the crime-solving team may also have a private investigator, a footwear specialist, crime scene specialist, assorted chemists, forensic toxicologists, a prosecuting attorney, defense attorney, and, of course, the forensic podiatrist. Sometimes, a forensic anthropologist or a forensic tracker can also

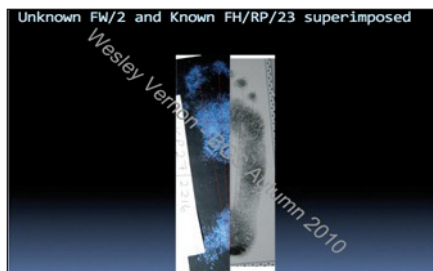


Figure 1: Known and unknown footprints superimposed (Courtesy John DiMaggio, DPM). Reprinted from the text *Forensic Podiatry, Principles & Methods*. John A. DiMaggio, DPM, and Wesley Vernon, DPM. Springer Science and Business Media: Humana Press, 2011.

become involved.

### Forensic Podiatrists

Today, in the U.S., the most prolific advocate of forensic podiatry is Dr. John DiMaggio, of Bandon, OR. His textbook, *Forensic Podiatry, Principles and Methods*, which he co-authored with Dr. Wesley Vernon of the UK is the accepted starting point for any podiatrist interested in pursuing work in the field.

### Professional Organizations

There are different professional organizations around, such as the International Society of Identification

(IAI), which train their members in disciplines such as crime scene specialist, footwear and tire track examiner, and latent prints examiner. Now, the IAI has added a forensic podiatry section to join with other disciplines such as forensic odontology.

Forensic podiatry, as it is practiced and studied in the U.S., owes much to Dr. DiMaggio and another like-minded individual, Dr. Michael Nirenberg, of Crown Point, IN. In 2003, their efforts established the American Society Of Forensic Podiatry, (ASFP) in order to provide a professional framework and guidance for advancing the discipline. Soon, the ASFP will be applying for professional status within the APMA, according to Dr. DiMaggio.

Until 2003, there was pioneering work going on by predecessors of Drs. DiMaggio and Vernon, such as Dr. Norman Gunn, of Toronto, Canada, who, in the 1970's began to use knowledge of the foot and pedal evidence to help in solving crimes. It wasn't until the mid 1990s that the term forensic podiatry had any meaning or substance.

When it comes to partnering advanced degrees in forensic science to podiatry, perhaps no one has done as much for the discipline as Dr. Vernon. His definition of forensic podiatry appears just after the heading of this article. Dr. Vernon has authored numerous papers and studies in forensic podiatry, and went on to receive his "Certificate of Competence in Forensic Podiatry," given by the Forensic Science Society of Great Britain, 2010. Dr. Vernon's advice to any doctor who wishes to become active in forensic science is to obtain advanced training in forensic science and/or any related discipline such as biochemistry, or biology.

Barry University, for  
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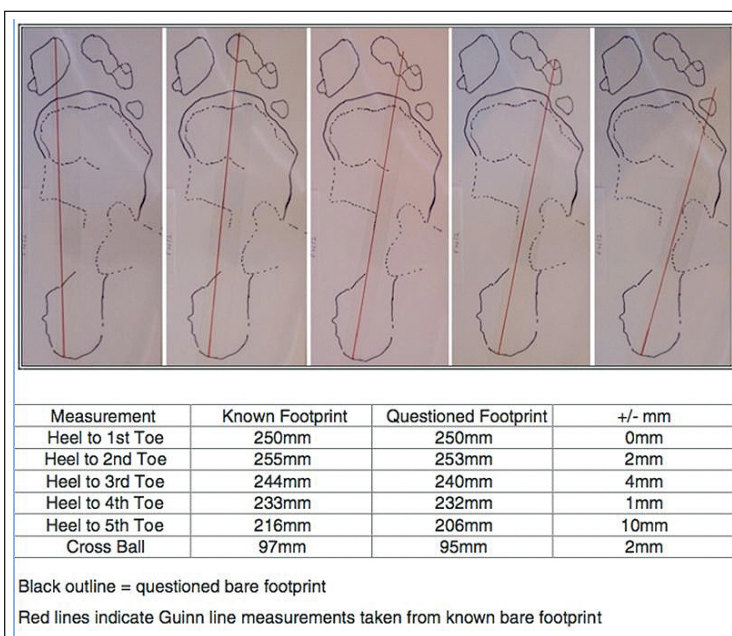


Figure 2: Crown vs. Clarke (2005): Comparison of known and questioned footprints (Courtesy John DiMaggio, DPM). Reprinted from the text *Forensic Podiatry, Principles & Methods*. John A. DiMaggio, DPM, and Wesley Vernon, DPM. Springer Science and Business Media: Humana Press, 2011.

example, in Miami, FL, offers undergraduate courses and a degree in forensic sciences. There are many rich avenues open for any doctor (or student) who elects to sharpen his acumen in the field.

Dr. Nirenberg has a section in his practice's website devoted to forensic podiatry, where he sheds some light on the history of the discipline. He says that before there was a discipline of forensic podiatry, "footwear forensics" was a criminology discipline. The following is an excerpt from his website: "Americaspodiatrist.com:

"The earliest recorded application of footwear forensics dates back to the late 18th century when a Scottish murderer's boot print was matched from the crime scene to one he left while attending the victim's funeral. In 1989, in my paper *Forensic Methods and the Podiatric Physician*, published in the *Journal of the American Podiatric Medical Association*, I advocated the need for a forensic podiatry organization. In September of 2003



Figure 3: Mike Sganga (left) and Dr. Arthur Washburn, PhD, in the anatomy lab of TUSPM. Temple University Press.

patterns of gait). At this time, footprints can't be used to tell us the inflection of a person's speech, or their eye color, but as you will soon see, it is surprising what footprints or a foot skeleton can tell us; for instance, as we shall see, the calcaneus can be used to tell a person's gender!

#### To Catch a Killer

Let us now take a look at an actual case, taken from Dr. DiMaggio's

ering the bodies in the house.

Lacking a clear motive, the young man was still regarded as "a person of interest" to the police. The reason he was suspected was because his parents had been stabbed in a very expert manner, consistent with the young man's training in the Filipino martial art of "Eskrima," which makes use of expert stick and knife handling. The police theorized that because of the suspect's fitness and training, he could have pulled off the murders, disposed of bloody clothing, and changed his own attire in those short ten minutes he was inside the house. Furthermore, surveillance video of the rock concert showed the young man disposing of a sports-sack of what appeared to be bloodied clothing. Still, at this point, it was only theory, and you cannot get a conviction based on suspicion alone.

At the crime scene, vague traces of footprints were found, and because of their proximity to the murders, they were investigated by using luminol enhancement, which makes blood much more visible. Next, the police requested footprints from the suspect in jail under a variety of conditions—walking, standing, light running, on a hard surface, and carpet. This was done because it was not known what activity caused the prints at the crime scene. Figures 1 and 2 show the luminol-enhanced footprints next to the actual footprints taken from the suspect in jail. After a likely match, they were superimposed

During a gait analysis of the suspect, he was made to recreate, to a close approximation, the footprints found at the crime scene. Two podiatrists, both skilled in forensic studies of this nature, were present to independently verify the results. A method was used to compare the distances from the heels of the prints captured at the scene, to the 5th, 4th, 3rd, 2nd, and 1st toes, with the corresponding distances of the suspect's prints taken at the police station. This forensic technique is called the "Gunn Overlay Method," and was devised by Toronto's Dr Gunn. It is explained in

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the American Society of Forensic Podiatry was established."<sup>2</sup>

In 2008, Fox News interviewed Dr. Nirenberg about his work catching criminals as one of a handful of forensic podiatrists in the world. You can view the interview here: [http://www.friendlyfootcare.com/int\\_henews.shtml](http://www.friendlyfootcare.com/int_henews.shtml).

Just how does forensic science make use of the various disciplines of podiatric medicine? The most basic aspect that people will recognize is, of course, footprints—how they are made, methods of detection, and what information can be gleaned by them (for example: approximate weight and height of an individual, type and make of the shoe, or, in the case of barefoot prints, pedal deformities, and

and Dr. Vernon's textbook, which, in fascinating detail, shows just a small yet powerful part of the role that forensic podiatry can play in the solving of crime.

A few years ago in Great Britain, a young adult who lived with his parents came home from a rock concert that he had attended earlier that same evening, only to find that his parents had been murdered—stabbed numerous times. According to his friends, when they arrived at the young man's home to pick him up, he told them that he had "forgot something," and said he would be about ten minutes inside the house. After he emerged from his home, they went to the concert without incident. Upon his return, he called the police after discov-

greater detail in Dr. DiMaggio's and Dr. Vernon's textbook:

The measured distances of the "Gunn Lines" taken from the luminol-enhanced prints and those of the suspect in jail were found to be a match beyond all reasonable doubt. These methods, when used alongside other forensic evidence such as shoes, and foot morphology deduced from the footprints found at the scene and later compared with the suspect, led the court to eventually find the suspect guilty of the murder of his parents.

### **A Rapidly Evolving Science**

The forensic sciences, as they relate to podiatric applications, are evolving today at a very rapid rate. The fastest growing technology is in the area of long-wave UV imaging of fingerprints, footprints, and shoe or boot prints. This technique is used to capture images of items such as dusty boot prints when they are not readily apparent. It uses UV radiation in the range of 300-400nm. By comparison, our visible light range is between 400 and 750nm. In fact, using the images produced by this method can even show details like a printed manufac-

ture will then "fluoresce" under this light.

### **Student Interest Needed for Growth**

If forensic podiatry is going to grow as a viable subspecialty, it has to develop a strong presence in the colleges of podiatric medicine. Today, the coupling of podiatric studies and forensic science within the domain of major university centers makes much possible, things that 20 or 30 years ago were unthinkable. One such place

with this condition will usually have a painful, abnormal gait pattern, and because of this, most seek some type of surgical correction during childhood.

After making these findings known to the police, they were able to put together that information with the rest of the information gleaned from other professionals who examined the remains. In a short time, after questioning local people who were around the murder scene at the

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is at Temple University School of Podiatric Medicine (TUSPM). In the spring of 2010, skeletal remains were found in back of a Philadelphia elementary school. Dr. Arthur Washburn, Ph.D., a professor of anatomy at Temple's medical school, was called upon by the Philadelphia Medical Examiner's office to help in the

approximate date of death, they were able to come up with the victim's identity. (It didn't hurt that the victim's wallet was found nearby!) This case made Mr. Sganga determined to have a podiatric career that included forensics.

Much data can be gleaned from just a few key bones—the skull and pelvis, for example, are used to determine the victim's race, ethnicity, and sex. Foot bones, while they can be informative, are usually under-utilized in most forensic exams. Mr. Sganga says, "I was surprised to find out that you can learn the sex of a person from just a heel bone. The length and width of the heel bone, like the more commonly accepted measurements of the skull and pelvis, can accurately determine whether the remains belong to a male or female."

Of course, one would expect a forensic podiatrist to concentrate on footprints, more than any other area. "Each footprint can only be made by that foot," Sganga says. "No two footprints are alike, and it does take an expert to distinguish that." But the similarities between foot and fingerprints end there. "Fingerprints are created by ridges and furrows in the layers of the skin, and that's unique to the individual hand," he explains. "It's a little different in that aspect, because the footprint is more [about]

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**—Sganga**

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turer's name in the print, which was completely invisible by any other method. The other research that is actively taking place today is in the area of thermal development of latent prints.

We all know that footprints or fingerprints leave some traces of organic matter on the substrate they are left on. In the 1940s, scientists discovered that applying just an ordinary household clothes iron to the prints would sufficiently char this organic matter and make it show up, whereas before, it would be barely detectable. Today there is work going on which exposes the prints to different frequencies of light after they have been exposed to heat. The charred organic

identification. He had been involved in forensic work for many years. At the same time, Mike Sganga, who is a podiatry student at Temple (Class of 2013) and a student of Dr. Washburn's, asked him if he could tag along on the investigation (Figure 3).

Before entering podiatry school, Mike was a research technician at Weill-Cornell medical college, and he has had a keen interest in the forensic sciences for a long time. This was a chance for him to possibly connect his love of criminal science and anatomy/podiatric medicine. During the investigation of the remains, Dr. Washburn and Mike found a tarsal coalition, a fairly common, usually congenital condition. Those afflicted

weight distribution and length.”

Dr. Washburn elaborates: “When you are talking about fingerprints you are looking at the little whorls and unique features of the little dermal ridges and we do have those on the toes. But when you are leaving a crime scene, your weight is distributed very differently than when you are leaving fingerprints. So while there are probably unique whorls and swirls on the toe and heel—though there is a lot of wear on the heel—when you are talking about footprint analysis, it’s not the same as talking about fingerprint analysis.

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**and current trends in the field.**

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It’s more along the lines of determining how a person distributes his or her weight.”

Right alongside of footprints, footgear is a very crucial aspect to the work of the forensic podiatrist. According to Mr. Sganga, “You can figure out just from looking at a pair of shoes where someone is putting pressure. One can determine foot types or gait patterns, some of which are very rare and unique.” Of course, everybody knows that “whenever you put your foot in someone else’s shoe, you know right away that it’s not yours,” added Dr. Washburn.

At this writing, the Forensic Podiatry Club at TUSPM has about 80 members, and is the first one of its kind. It is open to the Temple University and Philadelphia community, meets about once a month, and the students hear lectures and view presentations from various sources. NYCPM is also in the process of establishing a club under student founder Christie Esmaili and Dr. Michael Trepal as the faculty advisor. There is no reason that a club cannot be established in the other colleges as well. In the meantime, interested students can join the student chapter of the ASFP, which will give them access to newsletters, meeting informa-

tion, and training opportunities, etc. It might also be a good idea for the interested doctor or student to investigate the following two organizations as well: The International Association for Identification (IAI), which has a section in forensic podiatry, and The American Academy of Forensic Sciences (AAFS).

These last two organizations require some entry-level credentials, which most people will not have unless they have a degree or some training in anthropology or law enforcement. Still, this should not discourage anyone, for it is best to contact

the organization, and then to investigate and plan accordingly. Dr. DiMaggio has a background status as a reserve police officer. This gave him access to some forensic training and contacts through which he could pursue his interests in criminal work. It might be a good idea for you to contact your local police department and inquire about police auxiliary or reserve training.

Up until today, the literature and information available on forensic podiatry work has been limited, and what was available has been scattered. As a starting point for those interested, two textbooks can help such individuals get going. The first is Drs. DiMaggio and Vernon’s text; the other is *Forensic Podiatry, Principles and Methods, and Forensic Medicine of The Lower Extremity*, a book by Jeremy Rich, DPM, Dorothy E. Dean, MD, and Robert Powers, Ph.D. This book has a foreword by Dr. Kathleen J. Reichs, an active forensics practitioner whose work inspired the popular television series “Bones.” It has many color plates, is full of information on trauma analysis and reconstruction, the biomechanics of injury, and many actual case studies from around the world. It is easily available on either Amazon or Barnes and

Noble.com. These two texts should be present in any well-stocked podiatric library.

Another way for someone to gain knowledge and insight on forensic work is through good periodicals and online information. *Evidence and Technology Magazine* is an excellent source of information in new and current trends in the field. Within its pages, you can find contact information for authors and companies, which can offer training and seminars to doctors and students. IMPRIMUS Forensic Services, LLC. is a company which provides training for the crime scene professional. Take a look at their website at [www.imprimus.net](http://www.imprimus.net). Also, Michael E. Stapleton retired after 34 years with the FBI. For more than three decades, he conducted training courses for the Bureau in fingerprint identification and forensics. Now his company, Stapleton and Associates, LLC., provides forensics training and analysis. Their website is [www.StapletonAndAssociates.com](http://www.StapletonAndAssociates.com). The point is, if you have the desire and determination, the information is out there for the taking. Forensic podiatry is still in its infancy, and the rewards are well worth “tracking down.” PM

*Note: The author would also like to thank Drs. Michael Nirenberg, John A. DiMaggio, and Michael Trepal for their invaluable assistance in the preparation of this article.*

**References**

<sup>1</sup> Vernon and McCourt, *Forensic Podiatry: Role and Scope Of Practice*, April, 2009.

<sup>2</sup> [Americaspodiatrist.com](http://Americaspodiatrist.com), Nov. 2010.



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