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MASTER OF FINE ARTS

In

Medical Illustration

Forensic Art in Law Enforcement:
The Art and Science of the Human Head

by

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Forensic Art in Law Enforcement:

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Lastly, I would like to thank my family for always supporting me and never doubting that I would be successful studying fine art. It means the world to me and their continued support pushes me further each day to be the best individual and best artist I can be.

Abstract:

Forensic art is a highly specialized career field, but there are very few full-time forensic artists working today. There is only one school in the world that offers a degree in forensic art and it is located in Dundee, Scotland at the University of Dundee. The university's School of Science and Engineering offers a Master of Science (MSc) in Forensic Art and Facial Identification. However, there have been a variety of training courses and workshops provided for individuals interested in studying forensic art locally throughout the United States. Some people may have heard the term used before, but they still may not fully understand what forensic art is and how it is used in law enforcement. My goal is to spread light on the career field as a whole and explain how the process works. Many times forensic artists are called upon when all other options have been exhausted during a criminal investigation. I hope to educate everyone about the different types of forensic art methods and techniques being used today because they are valuable investigative resources that should not be ignored.

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Introduction

At an early age, I was intrigued by crime shows like *CSI* and *Law & Order* thanks to my father. He was in the police academy when I was born and began his career in law enforcement as a patrol officer in 1989. In 2013, he retired from the Indianapolis Metropolitan Police Department with the rank of Detective Sergeant after almost twenty-four years of service. As a child, I had always been fascinated by his job. However, I was equally fascinated with drawing and knew whatever career path I chose would somehow encompass art and law enforcement.

One day while watching a television show called *Forensic Files,* I listened to a woman named Lois Gibson speak about her sketch of a man who had committed a heinous crime. Below her name on the screen was her job title that read, "Forensic Artist." At that moment, I knew I wanted to be a forensic artist as well. In 2012, I graduated from college and enrolled into a course Gibson was teaching at Northwestern University Center for Public Safety called, *Forensic Art Techniques—Mastering Composite Drawing.* Shortly after completing the course, I became a certified forensic artist and began networking with other artists and law enforcement personnel via social media. In 2014, I was accepted into the Medical Illustration graduate program at the Rochester Institute of Technology. It was here where I began to further my knowledge of human anatomy and enhance my artistic skills. During graduate school, I was interested in learning more about the human skull and face because these are the primary structures forensic artists work with.

Now that I had chosen to be a forensic artist, I still had to figure out how to find employment doing this type of work. My graduate professor Craig Foster said it best, "You've chosen to study medical illustration, which is like aiming at a dartboard, but now you want to focus specifically on forensic art, which is like hitting the bullseye." Professor Foster was right. I knew the forensic art profession would be hard to pursue because full-time positions are limited and hard to maintain on a freelance basis. As an alternative path, artists have to find jobs in law enforcement instead. This allows a forensic artist to utilize his or her skills when needed, in addition to the regular job duties of a law enforcement officer. Another challenge forensic artists face is skepticism. Many people do not know the amount of science forensic artists study to

create successful images. Forensic artwork cannot be created by any artist, but must be produced by individuals who possess artistic talent and scientific knowledge of the human body.

My work is geared towards law enforcement personnel and government officials who need skilled artists to produce accurate forensic artwork for criminal matters and other investigative purposes. It is also for the family members of individuals who continue to maintain hope as they search for closure in the disappearance of their missing loved one, or for anyone who is trying to pursue a career in medical illustration or forensic art.

Over the last two years, I reviewed a variety of missing persons cases. With each case, I studied the physical characteristics of the victims' family members when available. This allowed me to create age-progressed, composite images of the victim based on the genetic similarities of his or her next of kin. When family reference photos were not available, I relied heavily on the craniofacial growth patterns and developmental trends of the victim based on his or her age, gender, and race.

Many established forensic artists working today use outdated methods and techniques. These methods and techniques are useful and should be learned because they are fundamental to the craft, but they are less sophisticated and more time consuming. As technology continues to advance, more forensic artists have moved away from traditional art-making techniques and gravitated more towards computer-generated methods. Having worked both traditionally and digitally, I can say that digital artwork is less time consuming to produce and easier to distribute in mass quantities than its predecessor. Regardless, whether I'm working traditionally or digitally, I always make sure to put forth my best effort to help solve a case.

Furthermore, it is imperative for forensic artists to understand that the most beautiful work of art means absolutely nothing if it does not help identify a missing person or suspect. Forensic artwork is successful when it helps to bring a fugitive to justice, reunite a missing child with his or her parents, bring closure to a grieving family member who never had a chance to say goodbye to his or her loved one, or provide a new lead in the case.

Section I: Scientific Background

I-a … What is Forensic Art?

Forensic art is a presentation of visual information that combines art and science to aid in the outcome of law enforcement matters and official legal proceedings. It is a highly specialized field of work that utilizes forensic anthropology, human anatomy, psychology, graphic design, and medical illustration for identification, apprehension, or conviction purposes. The website for the postgraduate program in forensic art and facial identification at the University of Dundee states, "Forensic artists need technical and conceptual art skills alongside comprehensive medical and anatomical knowledge" ("Forensic Art and Facial Identification," 2015). People who study medical illustration make great forensic artists because their educational training and understanding of the human body, along with their artistic talents, distinguishes them from traditional fine artists.

Some of my favorite forensic artists are Lois Gibson, Marla Lawson, Stephen Mancusi, Samantha Steinberg, Karen Taylor, and Gil Zamora. I was trained by Lois Gibson six years ago and have studied forensic art ever since. I noticed that many forensic artists continue to work traditionally with graphite on paper because this is how they were taught. This is how I learned as well, but have since created my own method. Now most of my forensic artwork is created on the computer using a combination of computer programs that specialize in three-dimensional space. This allows my work to look more realistic, which is key when trying to identify an unknown individual or missing person.

Originally, I primarily used Adobe Photoshop on a Wacom graphics tablet to create my artwork. I have since expanded to using other computer programs, such as: iClone 7, CrazyTalk 8, and Character Creator. These programs allowed me to create images with more realistic three-dimensional space. Working digitally has also saved me time and materials because everything can be created, completed, and distributed electronically. Non-traditional, computer-generated samples of my work are shown below (see Figure 1 and Figure 2).

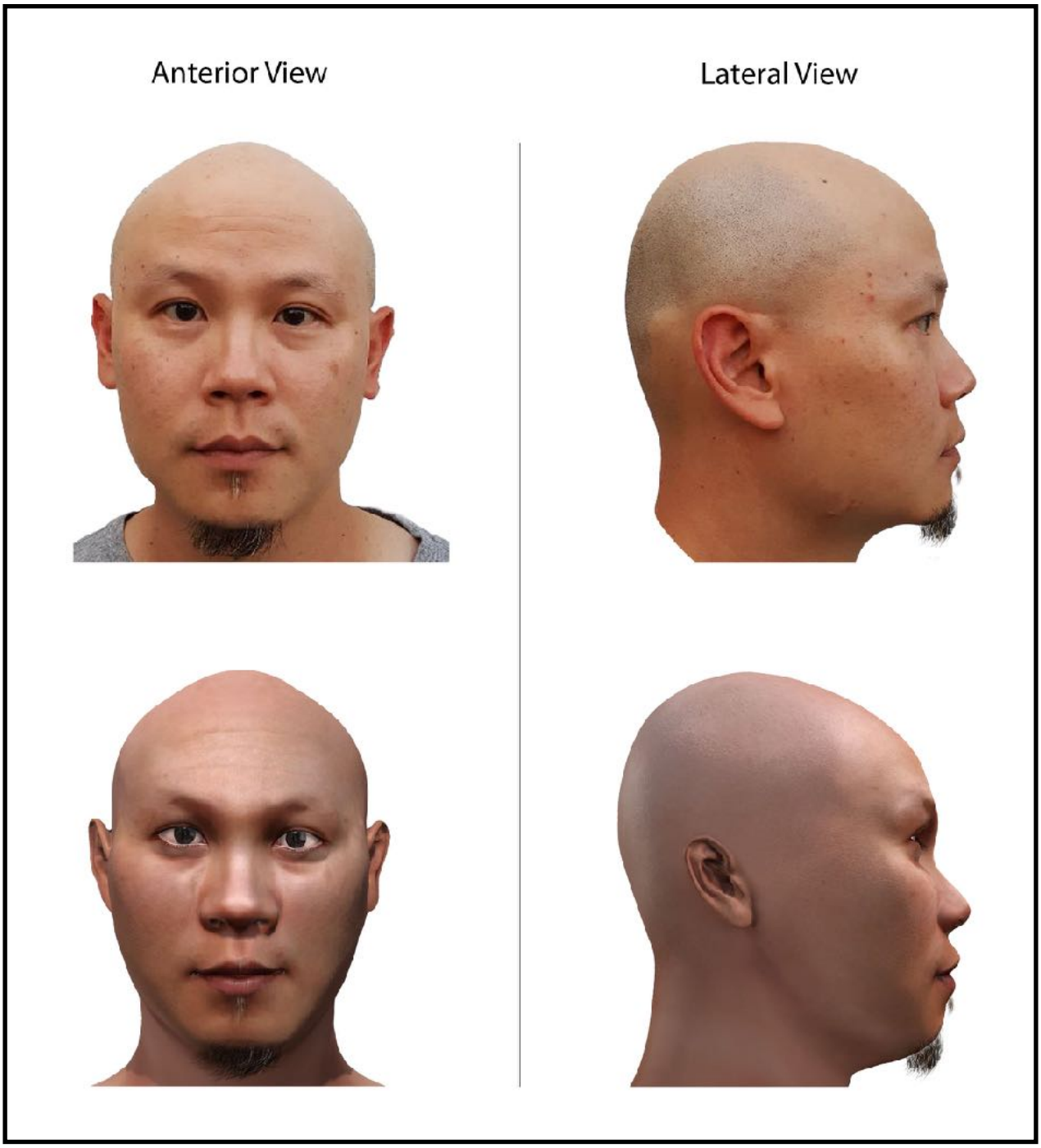

Figure 1: Asian Male; Above are images of an Asian male. The top row of images are photographs and the bottom row of images are computer-generated renderings I created digitally using Adobe Photoshop, Adobe Illustrator, CrazyTalk 8, and Character Creator.

Figure 2: Asian Male with Accessories and Hair; I combined my renderings with Adobe Photoshop and produced new images of the same individual with additional physical characteristics. I easily added facial hair, eyewear, and head hair to alter his appearance. I could also add headgear, jewelry, scars, and tattoos if needed.

Section I: Scientific Background

I-b … Forensic Art in Law Enforcement

Forensic artists have a tough a job. Usually they are considered law enforcement personnel and take on responsibilities beyond those of typical law enforcement officials and freelance artists. Forensic artists must understand psychology and know how to effectively interview victims and witnesses. They also need to have an understanding of the legal system in regards to expert witness testimony. Not only should forensic artists be well-reversed in human behavior and the criminal justice system, they must also be artistically inclined and capable of producing forensic artwork, graphics, and images when needed.

The information gathered during an interview with a victim or a witness will greatly increase the accuracy of a forensic drawing. Forensic artists must also rely on their scientific knowledge, artistic abilities, and reference photos to create accurate forensic artwork as well. As I mentioned earlier, a beautifully rendered portrait of the subject is of no use to law enforcement if it is not consistent with the information provided during the interview process.

In addition to these responsibilities, forensic artists must also store and maintain hard copies and electronic copies of case files (see Figure 3 and Figure 4). This is extremely important because not all cases are solved right away. Some cases may take months or years to solve. Therefore, maintaining accurate records is imperative to the progression and outcome of the investigation.

Figure 3: Storing Hard Copies; Portfolio cases work well to store and transport artwork. Cylindrical packing tubes can be used as well, but flat portfolio cases work better if you do not want to roll or bend the artwork. Lateral filing cabinets with a good amount of depth are also great for storing artwork at home or in a studio workspace. My portfolio cases are shown in the photograph above. The top portfolio case is 20”x26” and the bottom portfolio case is 22.5”x28”.

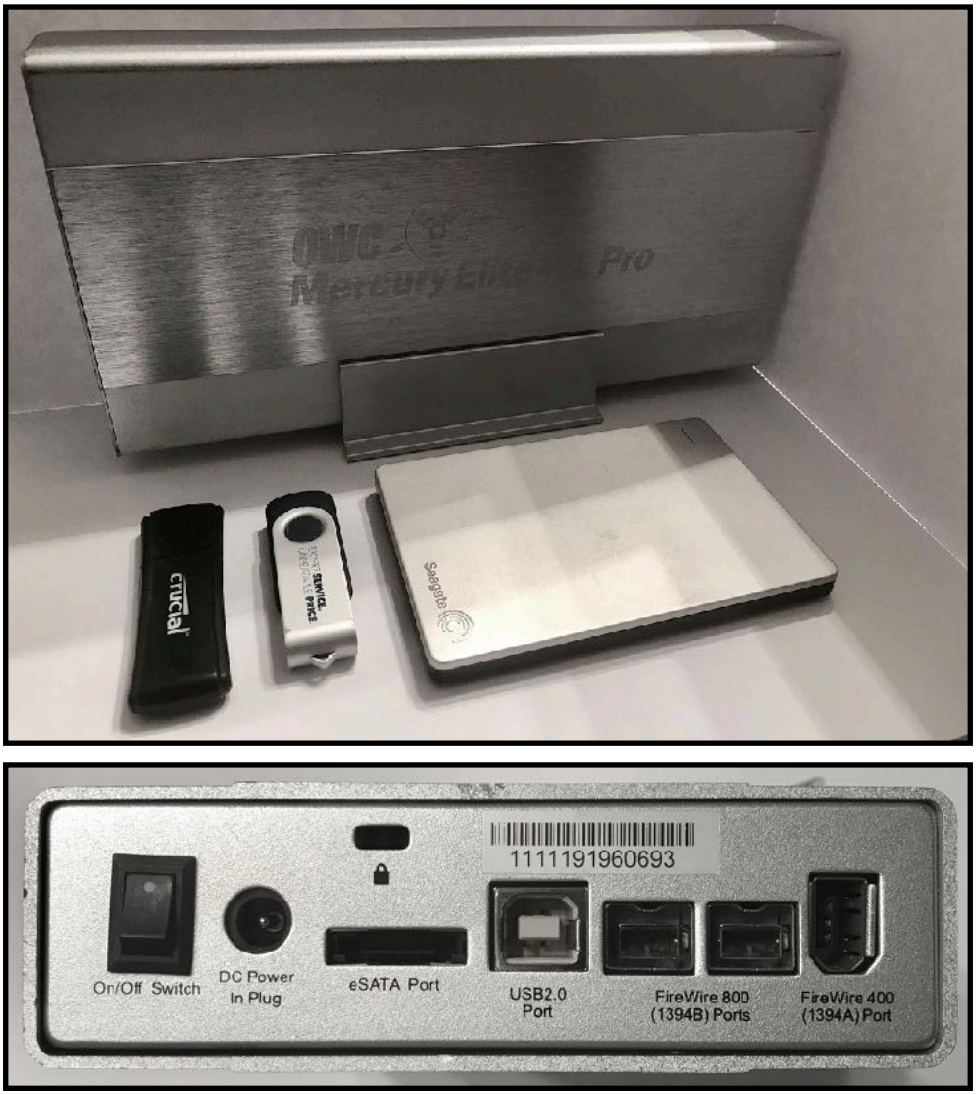

Figure 4: Storing Electronic Copies; I use a variety of methods to store electronic files. There are four (4) external electronic storage devices shown in the top photo. The largest device is a two (2) terabyte (TB) external hard drive. The small black device holds two (2) gigabytes (GB) of memory and the small silver device next to it holds four (4) GB of memory. These two devices are called USB flash drives or thumb drives. I use them on a daily basis when transferring small electronic documents. The flat, rectangular, silver device in the bottom right-hand corner of the top photo is another external hard drive. It holds five-hundred (500) GB of memory. The bottom photo shows the types of ports available on the two (2) TB external hard drive that can be used to transfer documents. I also use a cloud storage service through www.dropbox.com to store digital copies of my documents online when electronic, external storage devices are unavailable.

Section I: Scientific Background

I-c … How to Become a Forensic Artist

It is easier to become a forensic artist when employed by a law enforcement agency because civilians cannot access sensitive, investigative information and materials. Possessing artistic ability is a major part of the process, but working for an agency is the first step. After gaining employment with a law enforcement agency, a forensic artist can expect to produce forensic artwork for the agency, and other surrounding agencies, as needed. The artwork is usually completed in conjunction with the daily law enforcement duties and responsibilities of regular patrol officers. There are a handful of state and federal agencies that hire full-time forensic artists; however, these jobs are rare because people tend to stay in these positions long-term and retire. Nonetheless, with a little perseverance and determination, anybody who is motivated enough can find work doing forensic art and have a satisfying career.

There are many things that can be done to prepare for a career in forensic art. Obtaining a fine arts degree is extremely helpful. Enrolling in figure drawing, sculpture, and anatomy classes will help sharpen artistic skills and provide a better understanding of the human body. There are also workshops and training courses that artists can take on their own if college is not an option.

The general qualifications to become a certified forensic artist through the International Association for Identification (IAI) are listed on the IAI website. The IAI website states, “An applicant for certification must be of good moral character, high integrity, good repute, and must possess a high ethical and professional standing. Additionally, due to the multifaceted nature of the field of forensic art, the forensic art certification has three categories: Composite Imaging, Facial Reconstruction, and Image Enhancement or Age progression. The applicant can apply for a forensic art certification with an emphasis on any one or all three categories. However, an artist applicant should possess at least a fundamental knowledge of all three forensic art categories before applying” (“Forensic Art Certification,” 2018). The certification requirements, portfolio specifications, and testing procedures for new applicants, as well as a list of recertification requirements and forensic art training programs, can all be found on the IAI website.

Section II: Body of Work

I-a … Forensic Art Disciplines

The International Association for Identification (IAI) identifies three main disciplines of forensic art: composite drawing, image modification and age progression, and post-mortem facial reconstruction. Forensic artists tend to specialize in one major category, but should possess the artistic abilities and fundamental knowledge of each discipline to be well-rounded and stay competitive. Forensic artists may also use their skills during crime scene investigations to create diagrams, graphs, and three-dimensional reconstructions.

A composite drawing, also known as a composite sketch or composite image, is created by gathering information from a variety of sources to produce a clear image of an individual when a photograph of the person is unavailable. Information suggesting how a person looks is obtained during an interview with a victim or a witness, from a small or grainy photograph, or through video surveillance footage with low resolution (see Figure 5).

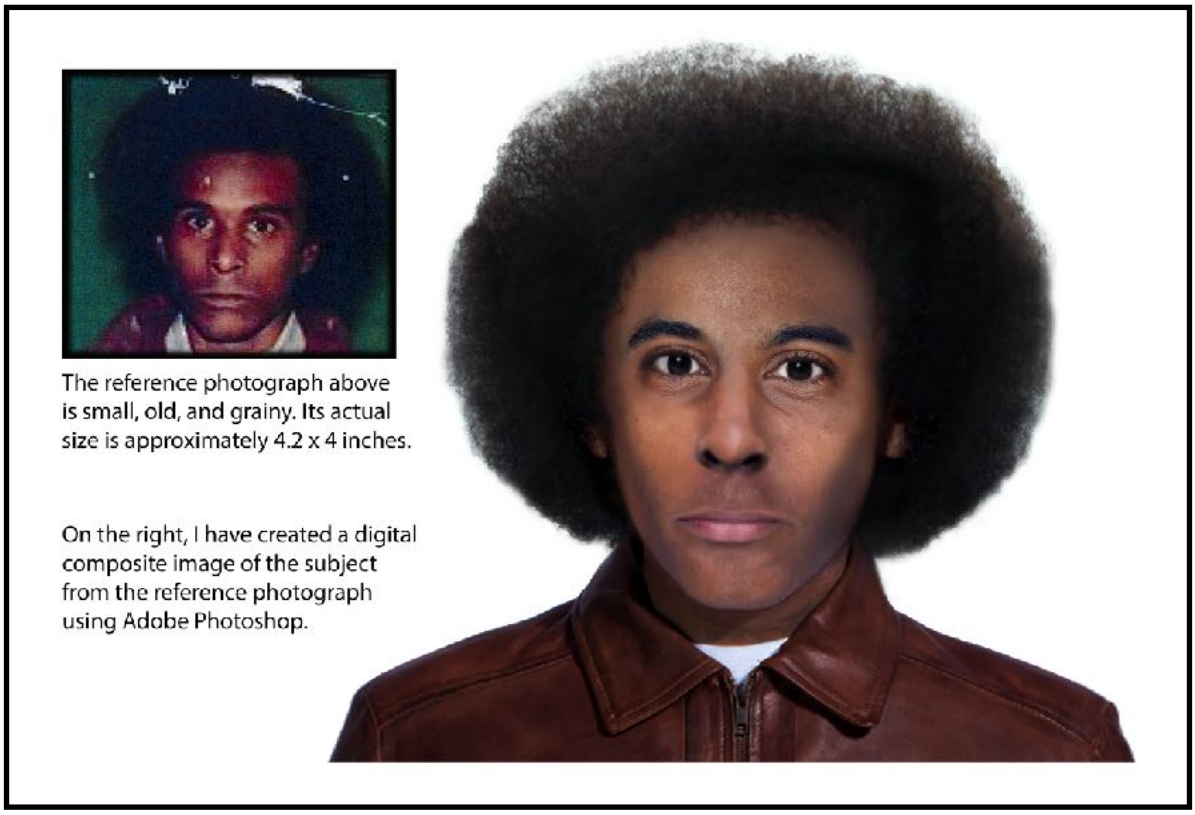

Figure 5: Composite Image; Above is an example of a digital, forensic, composite image. It was made using Adobe Photoshop, but can be drawn with graphite on paper as well.

Forensic image modification and age-progression is another discipline of forensic art. This type of work is created two-dimensionally, using pencil and paper, or digitally on the computer. The artwork can also be sculpted into three-dimensional busts using clay or plaster molds. This type of forensic artwork is produced when investigators have been searching for a missing person or fugitive over a long period of time. The artist creates an image of an individual depicting how he or she may look in the present day. (see Figure 6, Figure 7, and Figure 8).

Figure 6: Two-Dimensional (2D) Age Progression (Type A); Above is an example of a forensic age progression drawing. I created this image digitally using Adobe Photoshop with a Wacom graphics tablet. The photograph on the left shows a juvenile, identified as H.C., at six (6) years of age. On the right, I have aged-progressed H.C. to approximately age twelve (12).

Figure 7: Two-Dimensional (2D) Age Progression (Type B); When I am not working on active cases, I practice other image modification techniques by aging images of people on the internet. Celebrity photographs are ideal because the cameras used by the media and paparazzi usually have a high resolution and good lighting. The picture on the left is a red carpet photograph of actress Angelina Jolie. The picture on the right is an age-progressed photograph I created using a digital manipulation technique I learned during my training with the National Center for Missing and Exploited Children (NCMEC).

Figure 8: Two-Dimensional (2D) Age Regression; Above is an age-regression photograph I created using the same digital manipulation technique I learned during my training with NCMEC. Age regressions are important too because they help aid in the apprehension of on-line sexual predators. The image on the left is the original photograph, but I digitally manipulated the image on the right to portray a much younger female. It should be noted that law enforcement officials do not want to use images of real children to catch sexual predators.

Forensic artists are not magicians and must rely on a variety of information to predict how a person may look. On a website dedicated to forensic art and science it states, “Age progressions of fugitives are created to give fresh leads for investigators. Despite what some TV dramas may suggest, forensic artists don’t have any special gifts or psychic ability to predict what someone will look like in the future. What we *do* have is in-depth knowledge of facial anatomy, we’ve studied aging patterns of the face, and we have the artistic ability to illustrate those changes. Unless the investigator can tell us some new, specific information about the person’s appearance it really comes down to educated guesswork, using what we know about the person’s lifestyle and genetics” (Bailey, 2011). Forensic image modifications and age progressions can be challenging, but they are crucial. When all other methods have been exhausted, these techniques are imperative to solving and closing an investigation.

I have not done any three-dimensional forensic artwork in my career, but I do recall watching an episode of *America’s Most Wanted* that featured a forensic sculptor named Francis “Frank” Bender. The episode was about a man named John List who murdered his mother, wife, and three children in their home in Westfield, New Jersey in 1971. Authorities found the family dead in their mansion after neighbors became suspicious. The police worked on the case for many years, but it eventually went cold. Eighteen years later, in 1989, authorities contacted Bender and asked him to create a sculpture of the suspect. With the help of investigators and forensic profilers, Bender was able to gather enough information to create an age-progressed bust of the suspect. Less than two weeks after the bust was featured on *America’s Most Wanted,* a man living in Midlothian, Virginia was brought to the attention of authorities. The man’s name was John List, and he had been living under the alias Robert Peter "Bob" Clark for the last seventeen and a half years. Eventually, List was apprehended by authorities in Richmond, Virginia and extradited to Union County, New Jersey to stand trial for the murder of his family (see Figure 9).

Figure 9: Bust of John Emil List; Frank Bender was a forensic sculptor who created a plaster cast bust of John List. List was a fugitive who eluded authorities for approximately eighteen (18) years. In 1989, he was captured in Richmond, VA and finally brought to justice. Image (a) is a photograph of John List in his mid-forties. Image (b) is the mugshot of John List when he was captured by authorities in 1989. Image (c) shows the bust of John List created by Frank Bender. Image (d) shows another photograph of the same bust. (Bender, 1989).

Bender's bust resulted in a 'hit' of the suspect. In Law enforcement, a hit refers to the successful identification of a suspect or individual through a variety of law enforcement methods, (e.g. fingerprints, computers searches, DNA samples, photo arrays, hand-writing samples, forensic art, etc.) Although List was successfully apprehended, not every suspect is brought to justice through forensic art or other police methods. Some fugitives, such as William Bradford Bishop, stay on the run for years without ever being caught. However, efforts are still being made to locate individuals like Bishop and bring them to justice (see Figure 10).

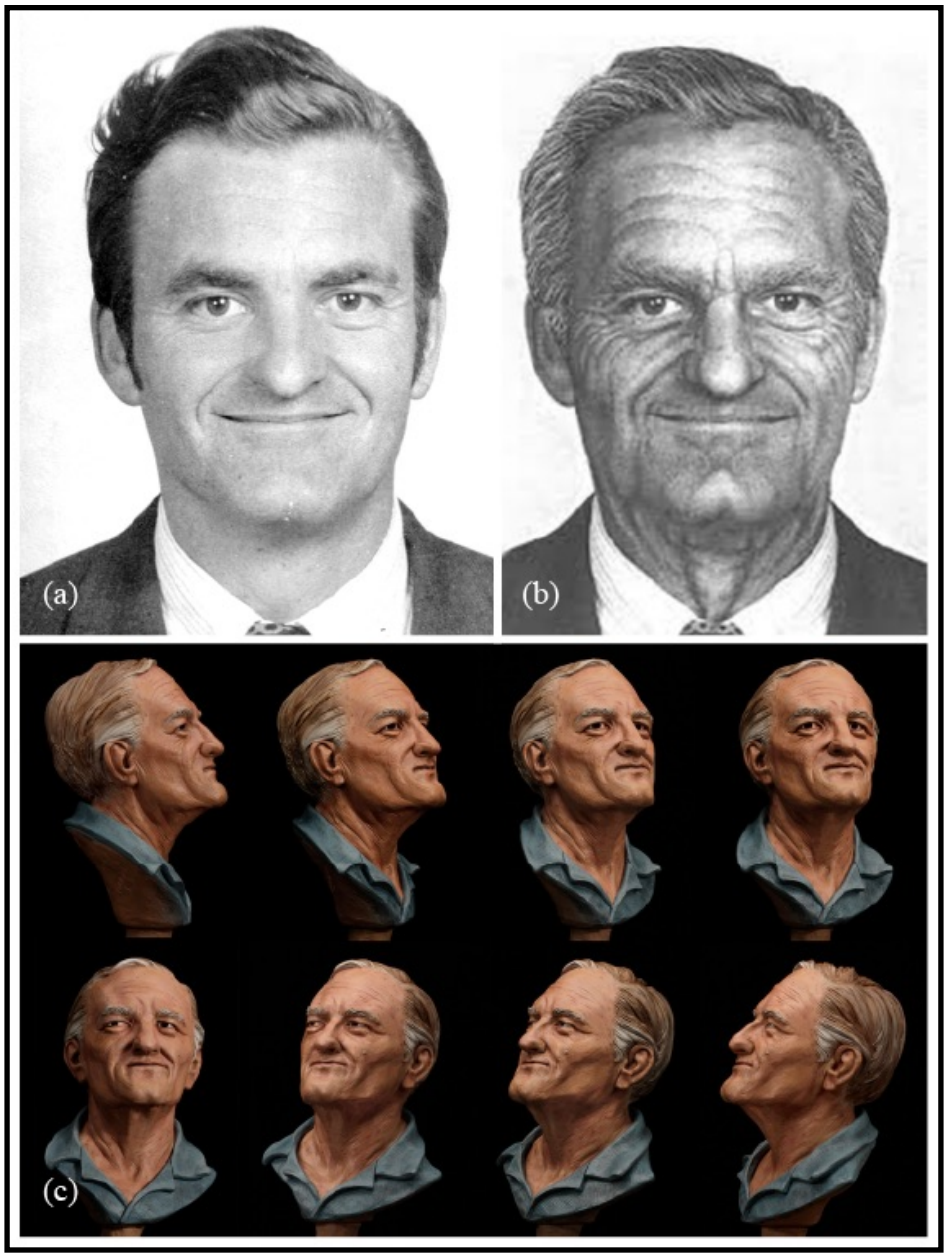

Figure 10: Bust of William Bradford Bishop; William Bradford Bishop is still a fugitive from justice. He allegedly killed five (5) members of his family in 1976. Image (a) is a photograph of Bishop in his early forties. Image (b) is a two-dimensional, age progression drawing created by an unknown forensic artist. The photographic images can be viewed on the Federal Bureau of Investigation's (FBI) website along with more information pertaining to Bishop's physical characteristics. In Image (c), a bust of Bishop can be seen at various angles. It was sculpted by forensic artist Karen T. Taylor, (Taylor, 2014).

The third forensic art discipline is called post-mortem facial reconstruction. To create this type of forensic artwork, artists view decomposed or partially decomposed human remains of the face and skull. The human remains are paramount in determining how an individual looked when he or she was alive. The post-mortem facial reconstruction can be done as a digital image, two-dimensional drawing, or three-dimensional bust. There are many post-mortem changes to the human body after death. Some changes are natural, but others occur due to factors such as, water, temperature, insect or wildlife, etc. It is imperative that forensic artists understand these changes and take them into consideration when working on post-mortem facial reconstructions. Morgue pictures are usually disturbing for the common viewer to see. Therefore, it is the forensic artist's job to render the deceased in a presentable fashion for the public to view —because the public plays a huge role in the successful identification of many subjects.

One special category of forensic art, called forensic facial approximation of the skull or forensic facial reconstruction, utilizes all three forensic art disciplines. This technique is used as a last resort when law enforcement officials cannot identify a body due to incomplete or damaged skeletal remains. A person's identity may also be unknown due to the lack of DNA, fingerprints, or dental records. Until the body can be identified, law enforcement officials and medical professionals will often refer to the deceased individual as 'John Doe' or 'Jane Doe' in regards to his or her biological sex. The sex of an unidentified person can be determined by a forensic anthropologist who is trained to identify the physical characteristics of skeletal remains.

Forensic facial approximations are very tedious. Its process is defined as, "Recreating the face of an unidentified individual from their skeletal remains through an amalgamation of artistry, forensic science, anthropology, osteology, and anatomy. It is easily the most subjective, (as well as one of the most controversial), techniques in the field of forensic anthropology. Despite this controversy, facial reconstruction has proved successful frequently enough that research and methodological developments continue to be advanced" (Wilkinson, 2008). Although the skull does not provide forensic artists with all the details of a person's appearance, it does allow artists to create a reasonable likeness of a deceased individual based on artistic skill, knowledge of forensic anthropology, and knowledge of human anatomy (see Figure 11, Figure 12, and Figure 13).

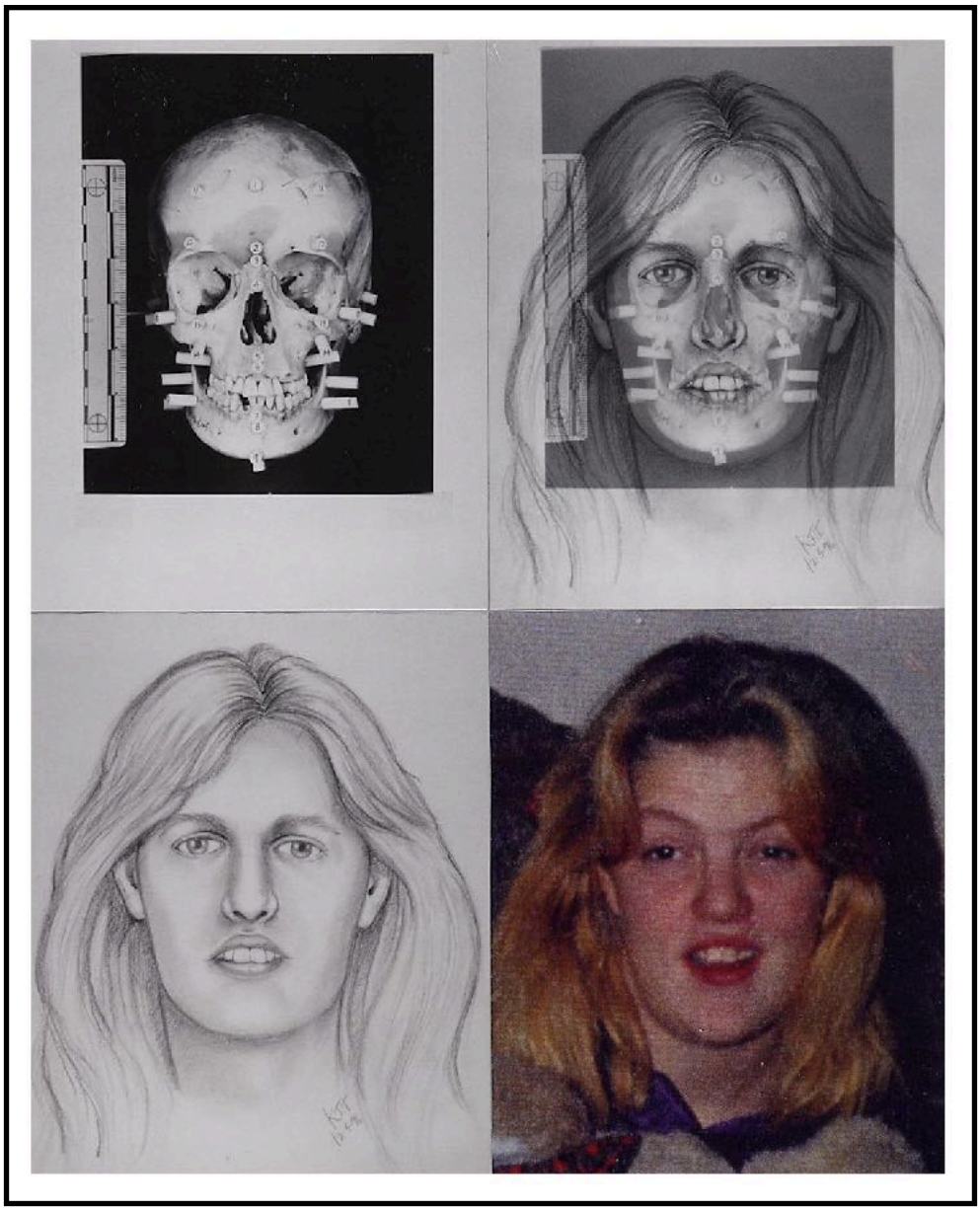

Figure 11: Two-Dimensional (2D) Post-Mortem Facial Reconstruction (Type A); This is an example of a 2D post-mortem facial reconstruction done by forensic artist Karen T. Taylor (Taylor, 2001). This facial reconstruction helped identify a homicide victim named April Dawn Lacy who was murdered in Decatur, Texas in 1986. Although her case remains unsolved, her body was identified because of an accurate facial reconstruction and good dental records. This facial reconstruction also utilized the forensic facial approximation technique.

Figure 12: Two-Dimensional (2D) Post-Mortem Facial Reconstruction (Type B); Above is an example of a 2D post-mortem facial reconstruction. I created it digitally using Adobe Photoshop. Out of respect for the victim and her family, the original case photo will not be shown due to its graphic nature. I did not utilize the forensic facial approximation technique because no decomposed images of the body were used to create the reconstruction.

A Dutch artist named Caspar Berger made a three-dimensional replica of his skull using a computed tomography (CT) scanner and a 3D printer. He sent the skull to a forensic anthropologist and challenged him to create an accurate bust of him with minimal information. On his website he wrote, “In this project, *Self-portrait 21*, the 3D copy of the skull represents the true image (vera icon). This image has formed the basis for a facial reconstruction by a forensic anthropologist, who received the skull anonymously accompanied only by the information that it belonged to a man in his mid-40s born in Western Europe. This facial reconstruction is based on the available scientific documentation of tissue structure, skin thickness and muscle groups. The clay reconstruction has been cast in bronze to be presented as *Self-portrait 21*, a self-portrait that has not been made by the artist.” The work is explained in detail below.

Figure 13: Three-Dimensional (3D) Post-Mortem Facial Reconstruction; The images above show the 3D facial reconstruction process. There are specific areas on the skull that were landmarked with a small protruding object. These landmarks represent the average thickness of facial tissue for someone of the same sex, age, and race. Once this was done, modeling clay was placed on top of the landmarks to approximate the thickness of soft tissue in that area on the face. Berger’s final bronze cast was created from the anthropologist’s bust (Berger, 2012)

Section II: Body of Work

I-b … The Human Head: Craniofacial Growth and Development

The human head consists of the skull, mandible, and face. The term craniofacial is an adjective used to describe the head and the facial structures attached to it. It is imperative that forensic artists understand how the head grows and develops because these changes determine how a person's face looks.

There are seven primary structures that determine the physical characteristics of the head and face. The most dominant structure is the mandible. The mandible, also known as the lower jaw, is attached to the base of the skull. It is the strongest bone in the face and holds the bottom row of teeth in place. The jawbone creates the main contour of the face and is the only bone of the skull that moves besides the ossicles of the middle ear. The remaining primary structures of the head and face are the nasal bone, maxilla, zygomatic bones, orbits, frontal bone, and teeth (see Figure 14).

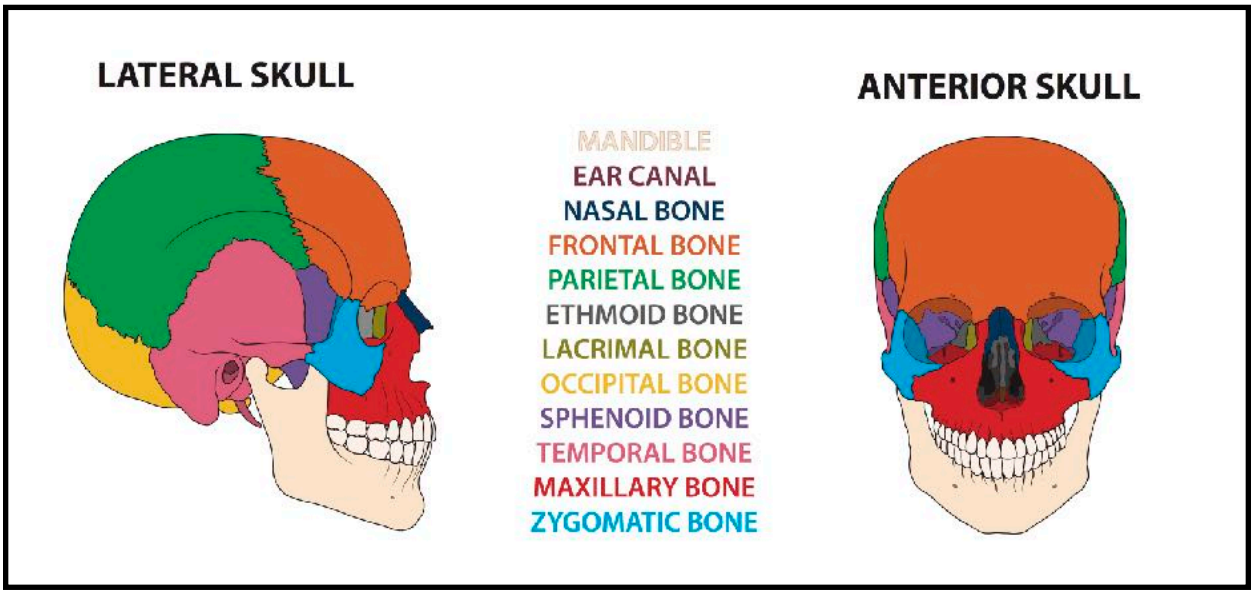

Figure 14: Anatomy of the Skull; Above is a vector diagram of the skull I created using Adobe Illustrator. The diagram shows the anatomy of the human head from a lateral view and an anterior view. The anatomical name for each bone is located in the center of the figure. They are color-coded to correspond with the bones of the same color in the vector diagram.

The face also has a variety of secondary structures that are extremely important to human identity. These structures are unique to every individual, making no two faces the same. The secondary structures of the face are the supraorbital ridges (brows), nose, mouth, eyes, cheeks, chin, and ears. These structures combined with other facial features and characteristics, such as skin tone, facial hair, and wrinkles, make the face more individualized.

Forensic artists should have a good understanding of rhytide patterns, or wrinkles, when producing age-progressed drawings. Wrinkles are important facial features that occur naturally in every human being. The author of a book about the anatomy of the human head wrote, "Wrinkle patterns are not a random phenomenon, but follow definite routes over the surface of the face" (Hogarth, 2002). The author continued writing, "Wrinkling of the face occurs for a variety of reasons. The most common reasons relate to incidental facial activity, such as chewing, grimacing, winking, pouting, squinting, expressions of pleasure and distaste, and demonstrations of emotion. Other reasons relate to psychological stress and inner tensions, as well as aging, muscular flaccidity, or loss of firmness in flesh. Whatever the origin of wrinkles, their development follows three major patterns: frontal, oblique, and lateral" (Hogarth, 2002). Understanding these patterns are crucial and help forensic artists create accurate scientific drawings. It is especially important when working on an age-progressed drawing because the individual looks more realistic when the wrinkles in the skin appear more natural (see Figure 15, Figure 16, Figure 17, and Figure 18).

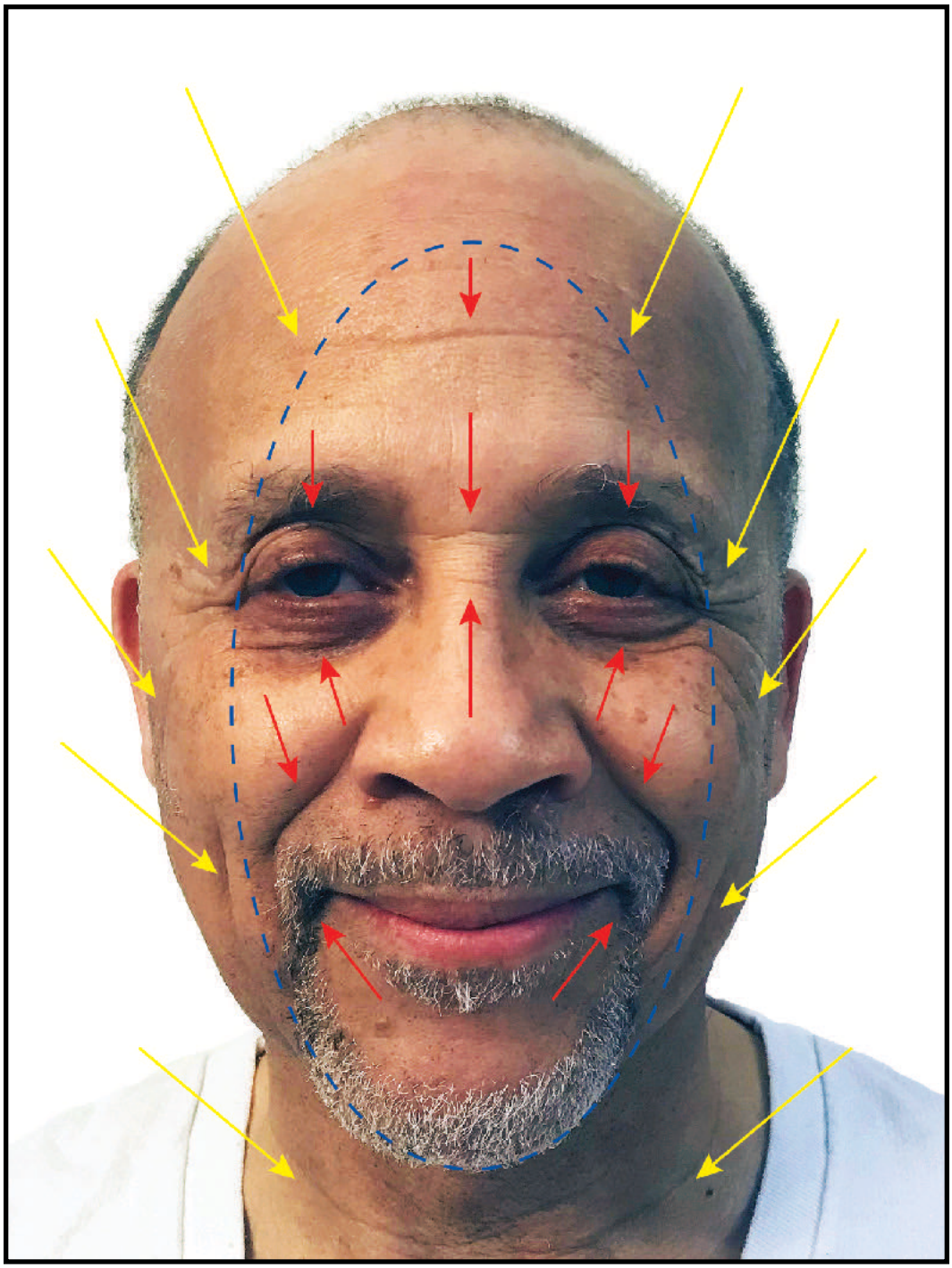

Figure 15: Frontal/Oblique Wrinkles (Male); Hogarth wrote, “The frontal pattern of wrinkles is heavily concentrated in the central region of the face. This pattern has its root in the nose bridge, and at the base” (Hogarth, 2002). The red arrows inside the blue, dashed, oval outline point to the frontal wrinkles. The yellow arrows outside the blue, dashed, oval outline point to the oblique wrinkles.

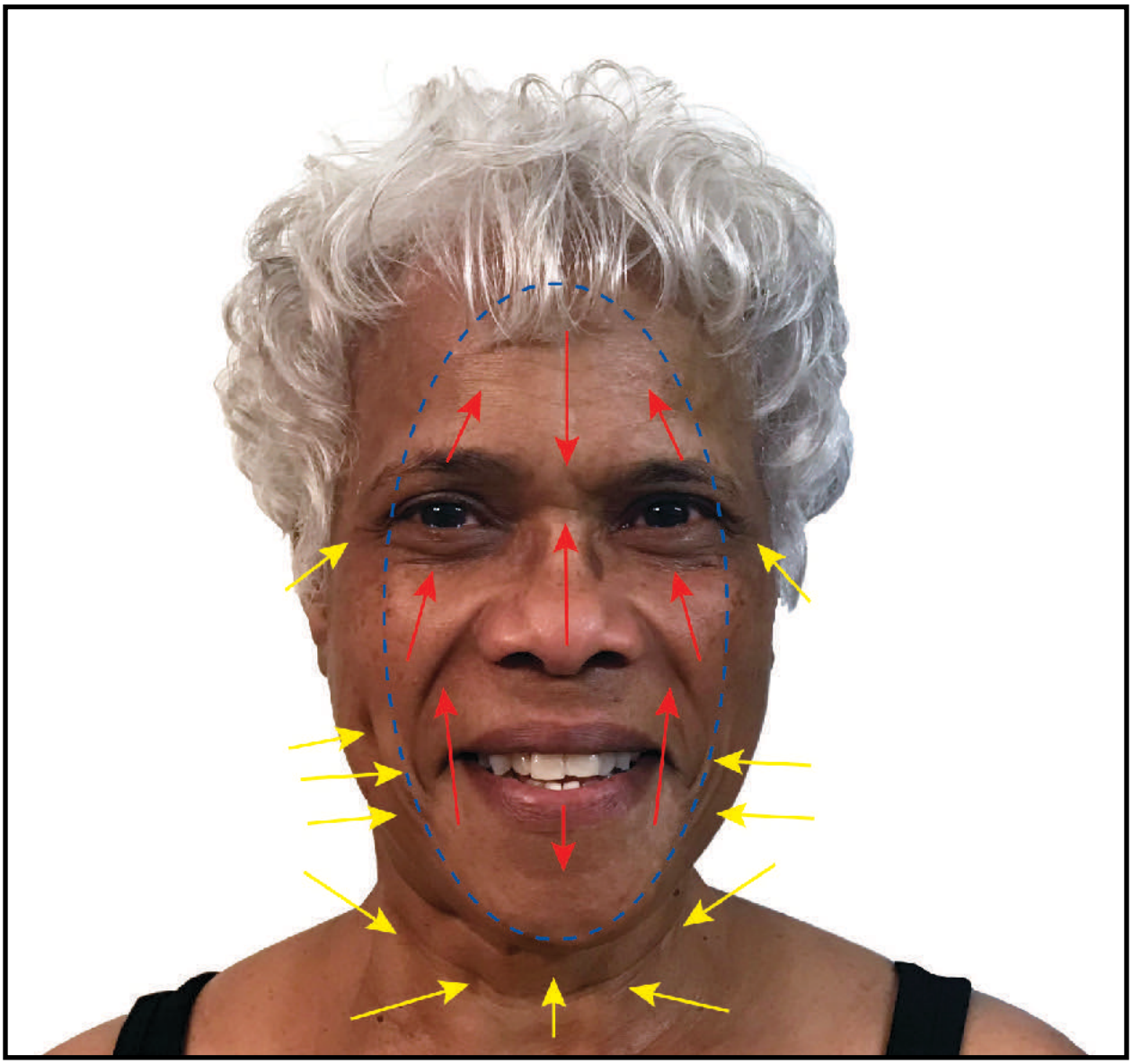

Figure 16: Frontal/Oblique Wrinkles (Female); Hogarth wrote, "The oblique pattern of wrinkles develops above and below the inside curve of the eye socket, and inner contour of the cheek bone. The oblique pattern belongs to the inner eye, the brow, and the cheek bone, as the frontal pattern belongs to the nose, the mouth, and the chin. The oblique pattern lies adjacent to the frontal pattern. Its main directions are angular and outward. It moves both up and down" (Hogarth, 2002). The red arrows inside the blue, dashed, oval outline point to the frontal wrinkles. The yellow arrows outside the blue, dashed, oval outline point to the oblique wrinkles.

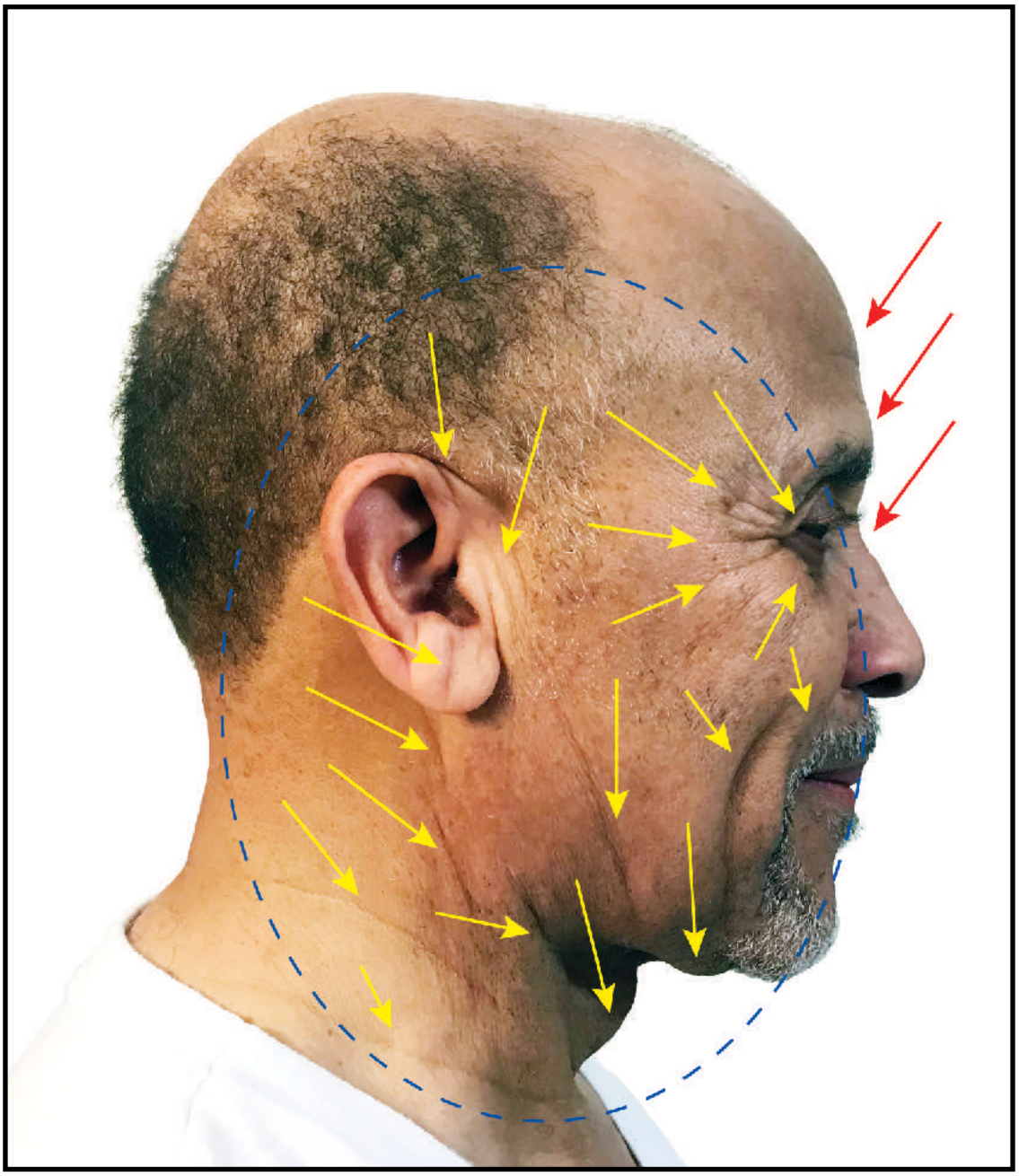

Figure 17: Lateral Wrinkles (Male); Hogarth wrote, “The lateral pattern consists of all the wrinkles on the side region of the face, neck, and back of the head. This diffuse pattern shows isolated furrows and rifts which emanate from the outer eye, ear, jaw line, and back of the neck below the skull base” (Hogarth, 2002). The red arrows outside the blue, dashed, oval outline point to the frontal wrinkles. The yellow arrows inside the blue, dashed, oval outline point to the lateral wrinkles. Gravity has shifted the skin downward in these areas.

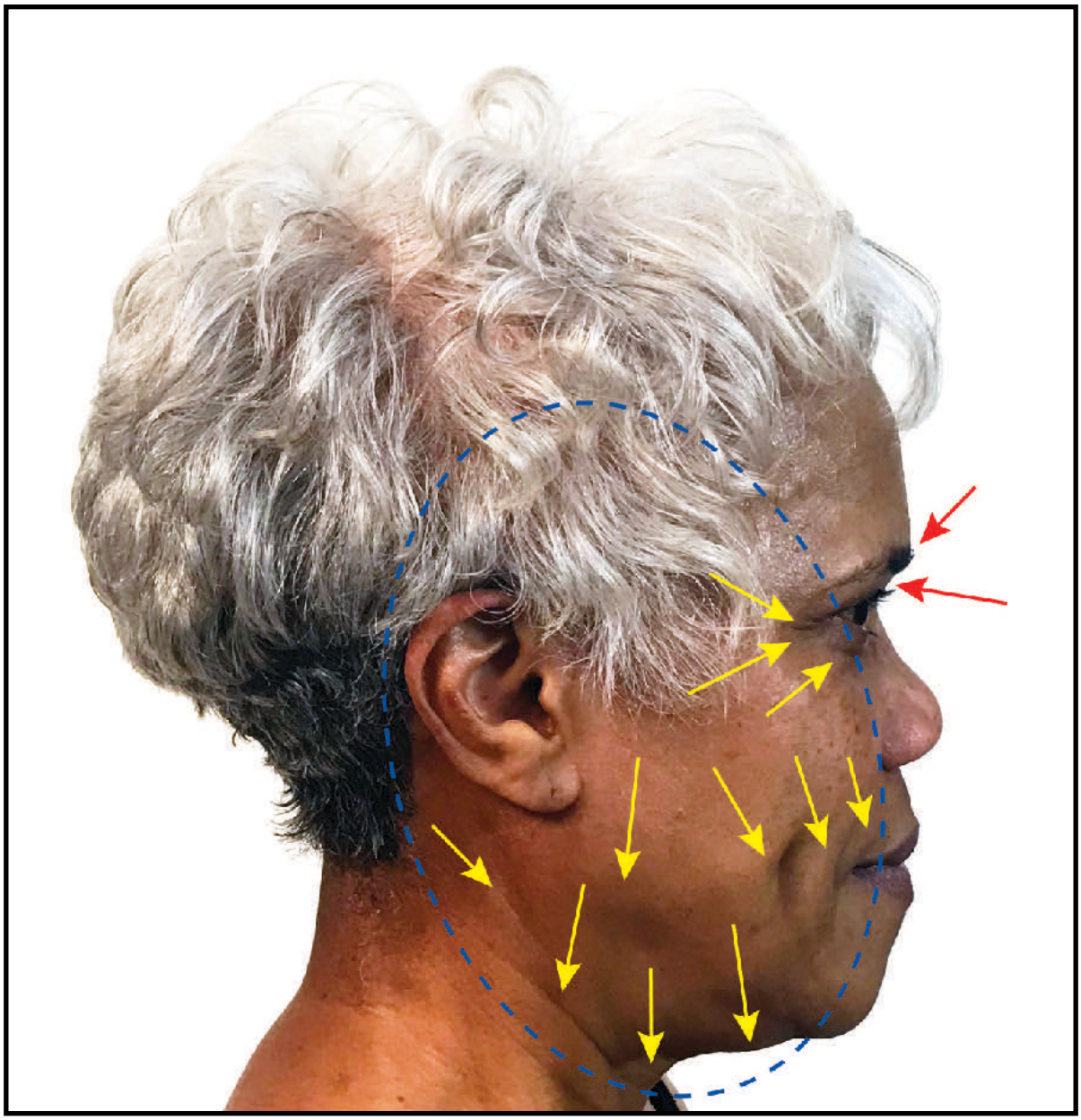

Figure 18: Lateral Wrinkles (Female); Muscles are repeatedly extended and compressed, which causes tension in the muscle fibers. Repetitive facial movements, such as smiling or frowning, will eventually cause wrinkles to form that can be seen on the surface of the skin. The woman in this figure informed me that her dimple used to be up higher on the side of her cheek, but overtime it has shifted downward. The red arrows outside the blue oval with the dashed outline point to the frontal wrinkles. The yellow arrows inside the blue oval with the dashed outline point to the lateral wrinkles. Gravity has shifted the skin downward in these areas.

Unlike the wrinkle patterns discussed earlier, some wrinkle patterns can be random due to the natural aging of the skin and how it changes with gravity. A book on the anatomy of the human head noted, “As we age, the flesh loosens and the skin shrivels; the tissues lose their firmness and elasticity. This creates what we may call sag and shrinkage wrinkles. These wrinkles are random and unpredictable. They usually sag downward as they are pulled by the force of gravity” (Hogarth, 2002).

Although gravity may be a huge factor in the formation of wrinkles, doctors have discovered that shifting bone structure may also be another reason why skin sags. An article from Duke University Magazine on cranial forms and facial structures concludes, “Researchers at Duke Medical Center have discovered that changes in the face's underlying bony structure may be the culprit. And those changes appear to occur more dramatically in women than in men” (“Cranium Changes,” 2008). This explains why cosmetic procedures such as botulinum toxin therapy (Botox), which treats various muscle spasms and diseases characterized by overactive muscles, do not permanently eradicate wrinkles in the skin.

Furthermore, Dr. Michael Richard, assistant clinical professor of ophthalmology and oculoplastic surgeon at the Duke Eye Center, added, “Our focus has always been on tightening and lifting the soft tissues, skin, and muscle in an attempt to cosmetically restore patients' youthful appearance. Based on this information, it might actually be better to restore the underlying bony framework of the face to its youthful proportions” (“Cranium Changes,” 2008). By studying computerized tomography (CT) scans, researchers discovered that the structures of the human skull continued to grow many years after puberty. During these studies, researchers noticed the frontal bone continued to move forward and the zygomatic bones continued to move backwards. As these bones moved, the muscles and skin on top of them changed as well. This caused the overall appearance of the face to be altered. Dr. Richard continued, “The facial bones also appear to tilt forward as we get older, which causes them to lose support for the overlying soft tissues and results in more sagging and drooping” (“Cranium Changes,” 2008). Forensic artists should be aware of this research and remember it when doing age progressions or any other forensic artwork that may require knowledge of craniofacial growth and development.

Section II: Body of Work

I-c … The Human Face: Variations by Age, Gender, and Race

The underlying skeletal structures of the human face are unique to each individual. The face also varies by age, gender, and race. Even monozygotic twins —who are created when a single egg is fertilized to form one zygote, then split to form two embryos— are never completely identical. "As the head ages, changes take place in the head proportions, skull development, and bone articulation in the brow, nose, jaw, and teeth. Growth in flesh, tissue, skin, lips, ears, eyelids, and hair all contribute to the descriptive aspects of aging" (Hogarth, 2002). These changes contribute to the uniqueness of one's appearance because the variation of changes are infinite. Other variables, such as gender and race, also play a huge role in how people look.

I have placed people into seven (7) age categories: babies, children, teenagers, young adults, middle-aged adults, older adults, and senior adults. In this context, I consider babies to be newborns, infants, and toddlers between the ages of zero (0) and three (3); children are older kids between the ages of four (4) and twelve (12); and teenagers are younger persons between the ages of thirteen (13) and nineteen (19). I have also classified young adults as anyone between the ages of twenty (20) and thirty-five (35), middle-aged adults between the ages of thirty-six (36) and fifty (50), older adults between the ages of fifty-one (51) and sixty-four (64), and senior adults as anyone who is sixty-five (65) years of age or older.

Different growth and developmental patterns of the head occur within these 7 age groups. Through my own personal observation, I noticed how the head of a baby is small, but the skull is large compared to the proportion of his or her facial structures. It also seems that most babies appear to have large eyes because their skull has not yet grown in proportion to their orbits. Through further observation, I also noticed that babies have more flesh on top of their zygomatic arches. This makes their cheeks look fuller and face seem rounder. In reference to a baby boy, a forensic artist noted certain growth patterns in the child and wrote, "The head is very rounded and the facial contours are full and rounded. There is the appearance of epicanthic folds and the eyes look large and rounded" (Taylor, 2001). Furthermore, I concluded that babies have a round

nose, small lips, and flat supraorbital ridges due to the brow arches of the frontal bone being underdeveloped.

As a baby develops into a small child, the head and face continue to grow and shift. The face is extremely round until approximately age three, but takes more shape as the jaw widens to make room for the developing teeth. The artist further noted, “The cranium expands to accommodate the growing brain. The maxilla and mandible have enlarged and widened to allow room for the deciduous dentition” (Taylor, 2001). These changes make the eyes seem more proportionate to the face because the inter-orbital distance between the eyes increases as well.

There are quite a few changes that occur in a child’s face and skull between the ages of 4 and 12. At around age 4, I can tell that a child’s face has lengthened and the bridge of his or her nose is more pronounced. At ages five (5) and six (6), I noticed that the face has grown even more, further lengthening the bridge of the nose and chin too. I can see that the chin is slightly pointed as well, due to the continued development of the teeth and enlargement of the jaw. As the skull continued to increase in length, the excess skin on the face decreased as well. The artist mentioned additional changes and wrote, “The bridge of the nose continues to rise up, lifting some of the excess skin from the medial corners of the eyes. The face continues to elongate as the nose length and the chin length increase. The forms of the lower cartilages of the nose become apparent and the tip takes shape” (Taylor, 2001). This loss of excess skin, which is often referred to as baby fat, makes the child appear more lean.

I also examined how the contours of the face and the musculature of the neck formed in children between the ages of 7 and 12. It was further described, “The face elongates. The childlike face is looking more juvenile as some of the facial forms become more apparent due to less baby fat. The nose continues to grow, both in the bridge and the nostril size. The mandible and chin continue to grow. The teeth seem big for the face” (Taylor, 2001). Although the teeth seemed disproportionate to the face, I could tell that they were almost fully developed as the skull continued to grow. Nonetheless, by the time a child becomes a teenager, he or she should have twenty-eight permanent adult teeth. According to the American Association of Oral and Maxillofacial Surgeons, “Wisdom teeth, or third molars, are the last teeth to develop and appear in your mouth. They come in between the ages of 17 and 25, a time of life that has been called

the ‘Age of Wisdom’” (“American,” 2016). Until then, the bridge of the nose deepens, the chin becomes more firm, and the facial muscles strengthen as the child transitions into a teenager.

The period of time between the ages of 13 and 19 are called the teenage years. During this time, more changes occur in the face, head, and neck. The same forensic artist continued her observations and acknowledged, “The cheekbones have become relatively more prominent. The nose has grown even more, revealing the nasal bones at the bridge. The forehead shape has remained consistent though it has grown and risen at the glabella” (Taylor, 2001). Furthermore, one author observed the facial changes of many teenagers and noted, “Nose bridge deepens. Nose tip still up. Jaw corner more angular; chin firmer, less rounded. Neck longer, a bit heavier. Understructure of head comes through; leaner facial appearance. Jaw angle firm. Mouth more firm. Neck muscles stronger, more developed. Skin texture firmer and thicker” (Hogarth, 2002). Overall, I noticed how teenagers looked less juvenile because their other facial structures, (such as their ears, eyes, mouth, and nose), became more proportionate to their head (see Figure 19).

I classified young adults as people between the ages of 20 and 35. During this time, the softness of their face disappeared and became more angular as the understructures of their skull formed beneath their skin. A man studying the anatomy and proportions of the human head observed additional facial changes in young adults. He wrote, “Deep nose bridge; nasal bone more pronounced. Lean cheeks and cheek bone. Chin mound more decisive; under-jaw region firm and even” (Hogarth, 2002). I observed the facial changes of many young adults on my own and noticed more firmness in their skin and an increased definition of their underlying facial structures as well. I noticed gradual changes in the face of young adults around age 30. The vigor of their skin was still intact, but signs of natural atrophy were present. I could see the subtle development of creases forming in their skin around the chin, corner of the eyes, forehead, and mouth. I often saw a slight sag in the skin underneath their chin and jaw as well. At approximately 35 years old, the subtle changes in the face seemed more noticeable to me. I would consider a person at this age to have a mature adult face.

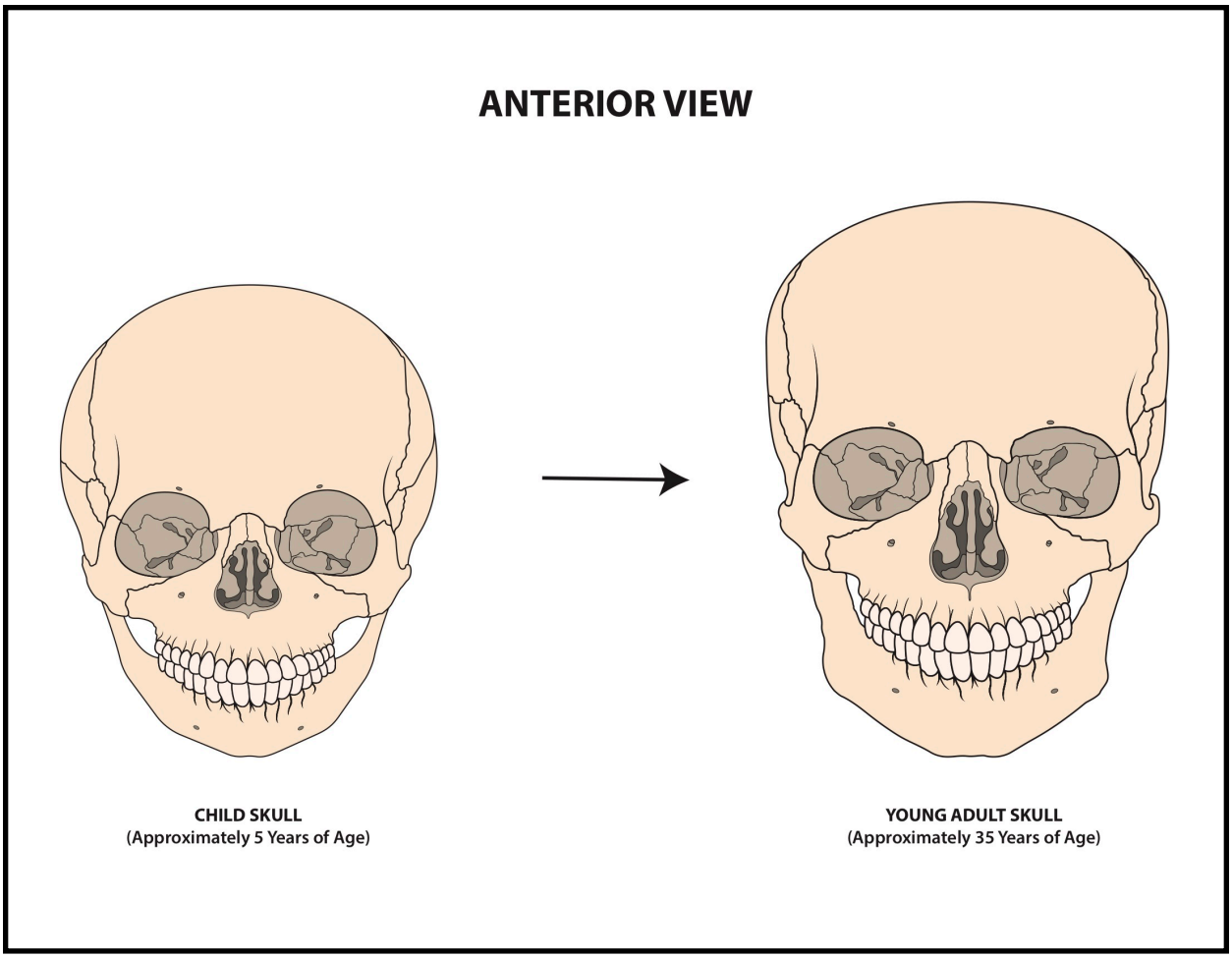

Figure 19: Differences Between a Child's Skull and a Young Adult's Skull; Overall, the skull of a child is smaller than the skull of an adult. The nasal opening is small and the length of the face is short. The jawline is short and round as well. However, the frontal bone seems large because the other facial structures are not yet fully developed. A young adult's jawline is large and angular. It is also wide due to the growth of mature teeth. The frontal bone, nasal opening, and zygomatic arches are proportionate to the other facial structures.

Sometimes it can be hard to determine how old a person is between the ages of 36 and 50 because the changes in their face are gradual and occur at a steady pace over an extended amount of time. However, this age group has many different facial characteristics. I primarily noticed the excess skin under the chin, eyes, and jaw. I also observed how the subtle creases in the skin became more apparent near the lateral edges of the eyes, mouth, nose, and furrow of the brows. The face appeared fuller and the skin under the jaw was soft and fleshy as well. The author noted, "First appearance of softness and fleshiness under jaw; chin mound cleavage occurs. Mouth wrinkle emerges. Under eye sag; further increase of eye and brow wrinkles. Neck less lean, somewhat heavier" (Hogarth, 2002). The author also confirmed my findings on head hair. I discovered that gray hair formed in both genders, but men were more likely to have a receding hairline by age forty (40). Additionally, I observed that head hair began thinning even more between the ages of 40 and forty-five (45) for both genders as well. At around age 50, I noticed a clear separation of the chin from the jawline in middle-aged adults. There was also a pattern of excess flesh that formed near the back of the neck.

I consider older adults as people between the ages of 51 and 64. Depending on their genetics, health, and life-style choices, some older adults look much younger, or much older, than their actual age. One forensic artist wrote, "Such factors as stress, diet, or illness affect the onset of the various [facial] lines, as do smoking and sun exposure influences" (Taylor, 2001). Nevertheless, it appeared that older adults usually had more wrinkles near their forehead, mouth, and eyes. The wrinkles were noticeable, but not as apparent as the wrinkles of senior adults who had less elastic skin. I saw how the upper eyelids on older adults sagged and formed crow's feet. However, their lower eyelids were more fleshy and sagged less. I also noticed that jowls had formed and created a fold of fatty flesh under their chin.

There are additional hair and facial characteristics that make a person look older. The author noted, "Hair quite thin on crown. Under eye pouch more decisive. Cheek bone and zygomatic arch apparent. Back neck fold deeper; front of neck shows sagging, folding, and shrinkage" (Hogarth, 2002). He continued further, notating the facial characteristics of a 60 year old adult, and wrote, "Bony features of skull apparent throughout. Nose forms more distinct. Lower facial region appears slack, flaccid" (Hogarth, 2002). I interacted with many adults

between the ages of 51 and 64 and saw the hair and facial characteristics Hogarth described above. I kept in mind the environmental factors, genetics, and lifestyle choices of these individuals while observing their unique features. I noticed a vast difference in the physical appearance of healthy and non-healthy individuals of the same age according to factors such as diet, physical activity, and smoking.

The last age category I have identified is senior adults. I consider senior adults to be people who are 65 years of age or older. I saw how the loss of collagen and elastic fibers made their skin become loose and stiff. Collagen is defined as, "Any of a class of extracellular proteins abundant in higher animals, especially in the skin, bone, cartilage, tendon, and teeth, forming strong insoluble fibers and serving as connective tissue between cells, yielding gelatin when denatured by boiling." ("Collagen," 2018). The loss of collagen occurs naturally in the aging process and gravity increases the sagging of the skin. One author's notes concluded, "Folds and creases deepen around the corners of the mouth, jaw, and neck. Tooth loss causes jaw shrinkage; jaw angle less steep. Chin more prominent. Nose seems enlarged. Mouth folds deeper. Network of smaller wrinkles develops throughout head" (Hogarth, 2002). I saw these changes and noticed how distinct the bridge of the nose and nostrils were in people over 65. I also observed how the tip of their nose appeared large and bulbous. My great-grandfather lived to be ninety-four (94) years old and he exhibited some of the same physical characteristics mentioned above. His jawline was less defined because the loss of collagen in his body made his skin loose (see Figure 20). Although many substructures on a senior adult's face are less-defined, other structures, (such as the frontal bone, temporal bones, and zygomatic arches), can still be seen.

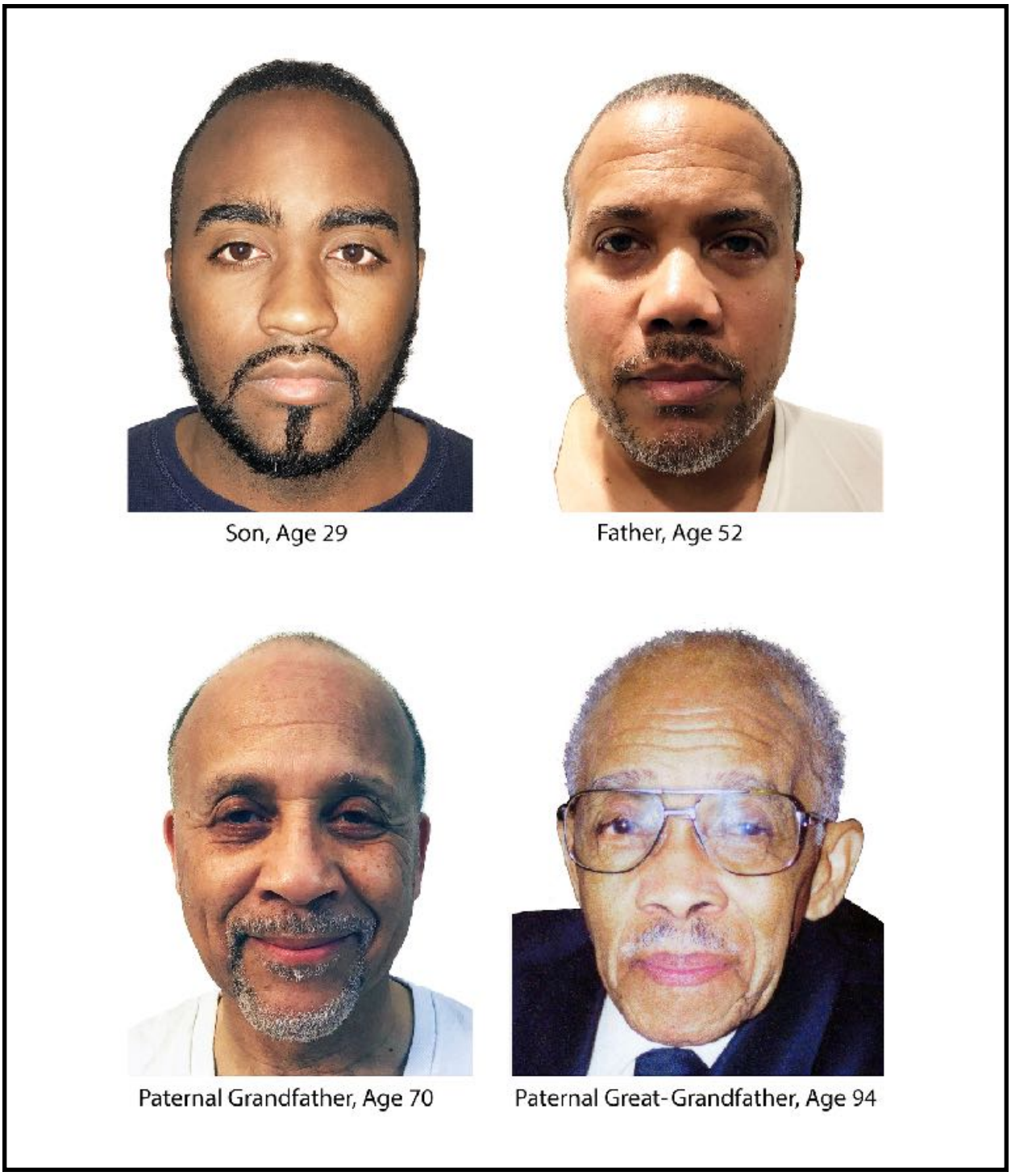

Figure 20: Four Generations; The figure above shows four generations of men from the same family. The development of rhytide patterns increases from the son, father, paternal grandfather, and paternal great-grandfather. The effects of gravity on the skin are also distinguishable between each photograph as well.

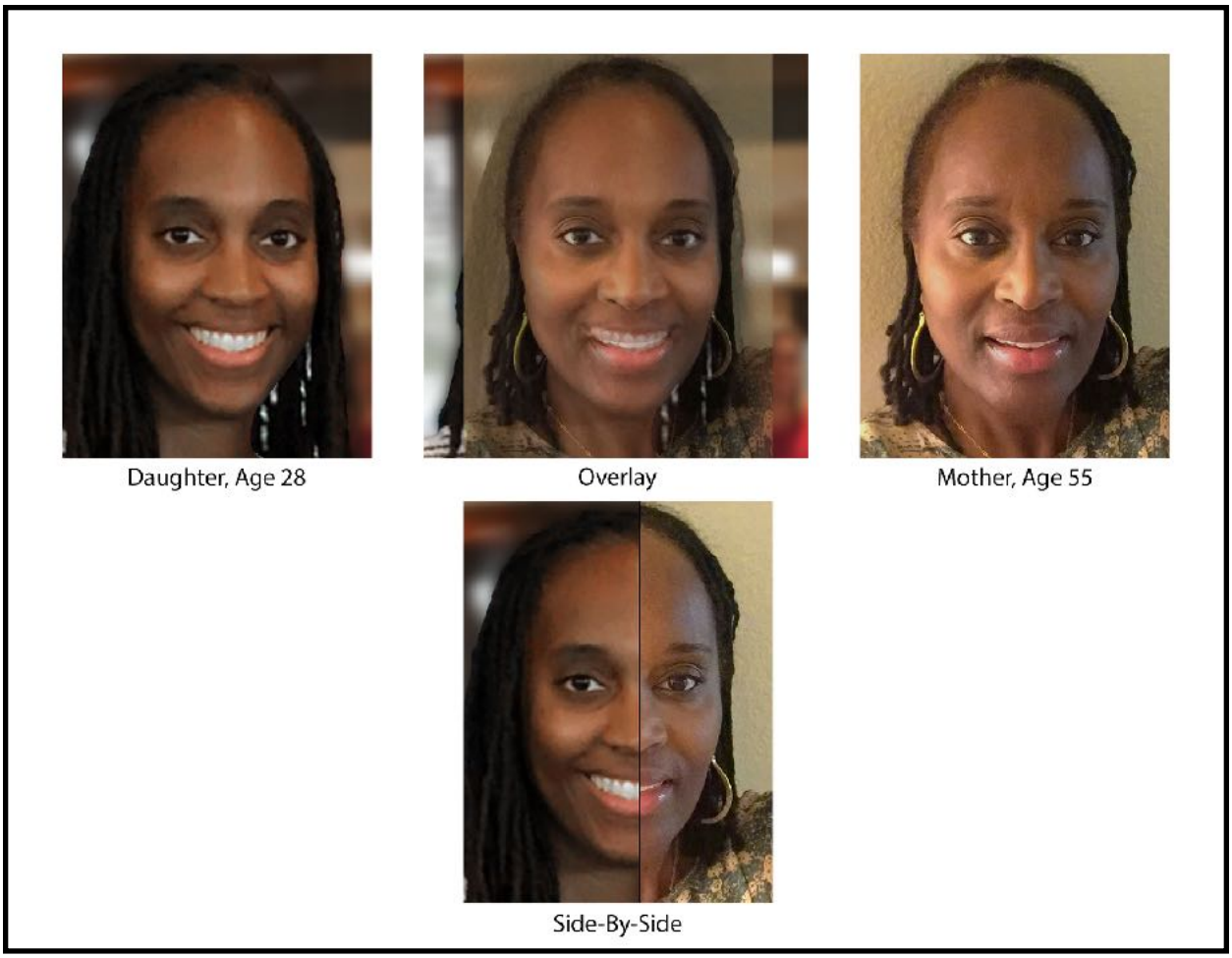

Figure 21: Two Generations; The figure above shows two generations of women from the same family. The development of rhytide patterns increases from the daughter to the mother. Based on the development of these patterns, a forensic artist can predict what the daughter's face will look like in each age category as she gets older.

Gender, or sex, is another variable that contributes to the structure of the human head. It is imperative to understand the differences between the male and female skull because the underlying structures vary in size and shape depending on the sex. A forensic artist confirmed, "Generally speaking, anthropologists expect male skulls to be more robust with more pronounced muscle attachment indicators" (Taylor, 2001). The bony elevated surfaces of the skull, known as the muscle ridges, are where the muscles attach to the skull. They are usually larger in males and include the temporal lines, which attach to the temporal bones, and the nuchal lines, which attach to the occipital bones. This is the type of information forensic artists must know when working on post-mortem facial reconstructions. Proper placement and size of the underlying musculature of the skull increases the likeness of the individual being reproduced.

I observed many other differences between the male and female skull. Overall, the male skull is larger and more angular than the female skull. The male mandible is also much larger and the angle of the jaw is more defined. A female's mandible is less defined and much smaller in proportion to the skull. The supraorbital ridges and mastoid processes on the male skull are more pronounced, whereas the same structures on the female skull are more subtle and smooth. Males also have a sloping or receding frontal bone, but the female frontal bone is more vertical. I realized that the external occipital protuberance (EOP), also known as the inion, is more prominent in males as well. *The American Heritage Stedman's Medical Dictionary* defines the inion as, "The most prominent projecting point of the occipital bone at the base of the skull" (Stedman, 2007). On a diagram of the human skull, I located the inion on the back of the head near the lower, rear portion of the occipital bone (see Figure 23).

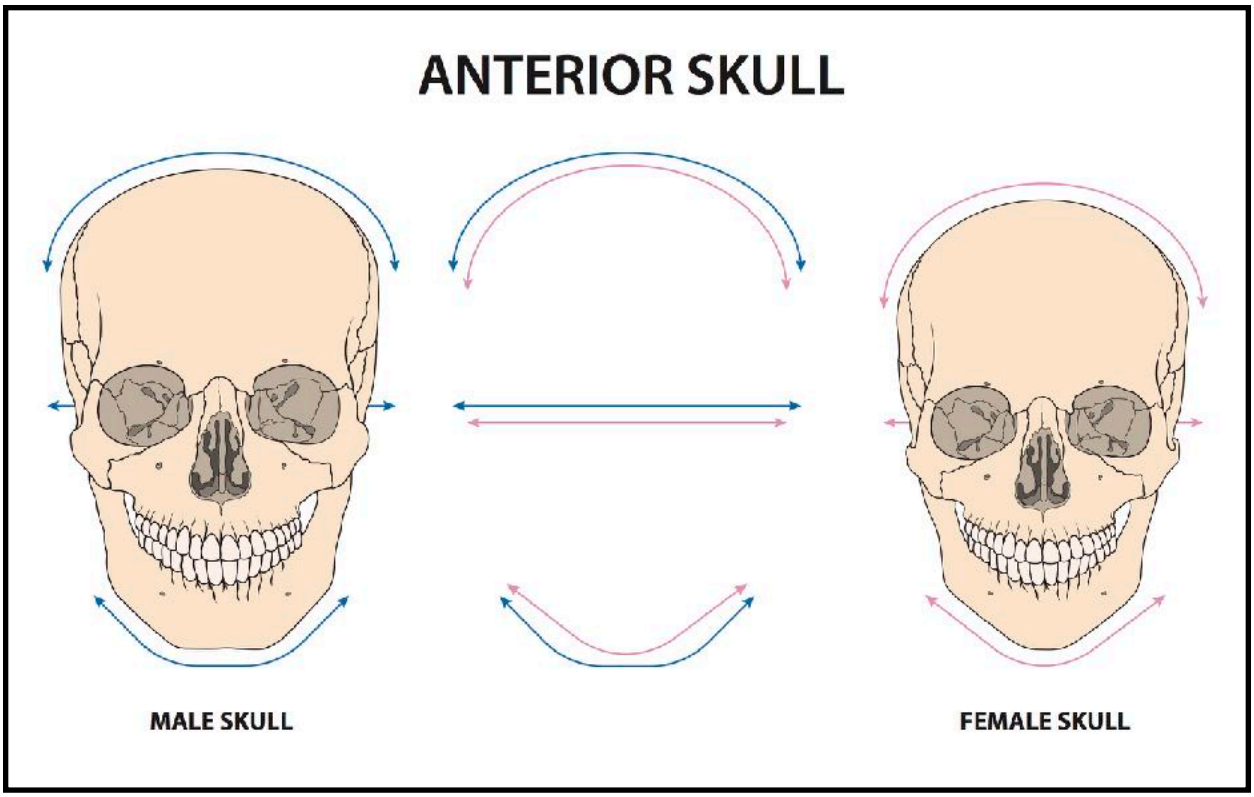

Figure 22: Differences Between the Male and Female Skull (Anterior View); The male skull is larger and wider than the female skull. The male mandible is large, wide, and square compared to the small, narrow, and pointed female mandible. The zygomatic arches on the male skull are also larger than the zygomatic arches on the female skull as well.

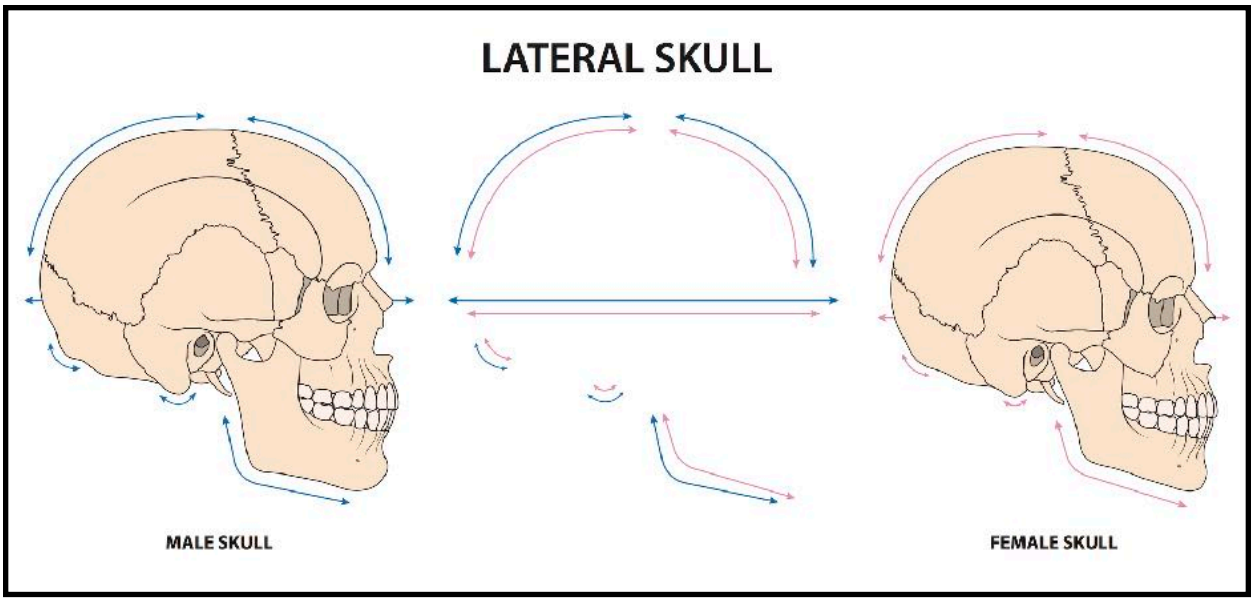

Figure 23: Differences Between the Male and Female Skull (Lateral View); The male skull is larger and wider than the female skull. The mandible on the male skull is large, wide, and square compared to the small, narrow, and pointed mandible on the female skull. The female mandible is more obtuse than the male mandible. The zygomatic arches on the male skull are larger and less pointed than the zygomatic arches on the female skull. The supraorbital ridges and mastoid processes are larger and more pronounced on the male skull as well, but subtle and smooth on the female skull. The frontal bone on the male skull has a larger slope, while the female frontal bone recedes less and is more vertical. The EOP is more prominent on the male skull also.

While studying the anatomy of the human head, I learned that there are three (3) different head-types. Each head-type is classified by the cephalic index —which is an established standard of head measurement. The cephalic index is specifically defined as, "The ratio of the maximum width of the head to its maximum length, multiplied by 100" (Stedman, 2007). In the book, *Drawing the Human Head,* the head is classified as a broad-headed (brachycephalic), long-headed (dolichocephalic), or medium-headed/intermediate (mesocephalic) head-type (Hogarth, 2002). Hogarth described individuals with a brachycephalic head-type as having a wide skull and a medium to low positioning forehead. Furthermore, he noted that their face and facial features were usually more compact, square, and short. He observed that people with a dolichocephalic head-type had a long and narrow skull. In addition, he noted that their forehead was either moderately arched or highly arched. If their forehead was highly arched, he determined that their facial structures tended to be much longer. The third head-type in the cephalic index is called the mesocephalic head-type. Hogarth described people with this head-type as having an intermediate-sized skull, oval-shaped face, and small facial structures.

Head-types do not identify specific individuals by age, gender, or ethnicity. However, it is important to be aware that these head-types exists and vary across all races of people. In an excerpt from the book, *Drawing the Human Head*, it says, "No one particular group of persons can be identified by a single head type classification or facial slope. Head form variations run through the individuals of all population groups" (Hogarth, 2002). Forensic artists should keep this in mind and store this information for future use. It will be imperative when producing forensic artwork of unidentified, deceased individuals with missing skull fragments or damaged facial structures.

Race also plays a huge role in the structure of the human head and face. In anthropology race is defined as, "Any of the traditional divisions of humankind —the commonest being the Caucasian, Mongoloid, and Negroid— characterized by supposedly distinctive and universal physical characteristics" ("Race," 2018). Generally, these physical characteristics include: skin color, pigmentation, facial form, hair texture, and body proportions. Within the 3 divisions of humankind, I have established ten (10) geographic races. Individuals of European, Middle-Eastern, and Mediterranean decent are considered Caucasoid; Asian and Native American people

are considered Mongoloid; People of African, Melanesian, Micronesian, Polynesian, and Australian Aborigines decent are considered Negroid.

Within these 3 divisions, I discovered many physical differences in face and head from the lateral view (see Figure 24, Figure 25, Figure 26, and Figure 27). In chapter 3 of the book, *Forensic Art and Illustration*, the author wrote, "In profile, many Caucasoid skulls exhibit a somewhat flat face with zygomatic bones that retreat or slant back. Frontally, the nasal openings tend to be longer and narrower than in Mongoloids and Negroids" (Taylor, 2001). While people-watching at the Indianapolis International Airport (IIA), I observed the facial features of many Caucasian passengers. I compared their facial features with the facial features of people from other racial groups to study the differences.

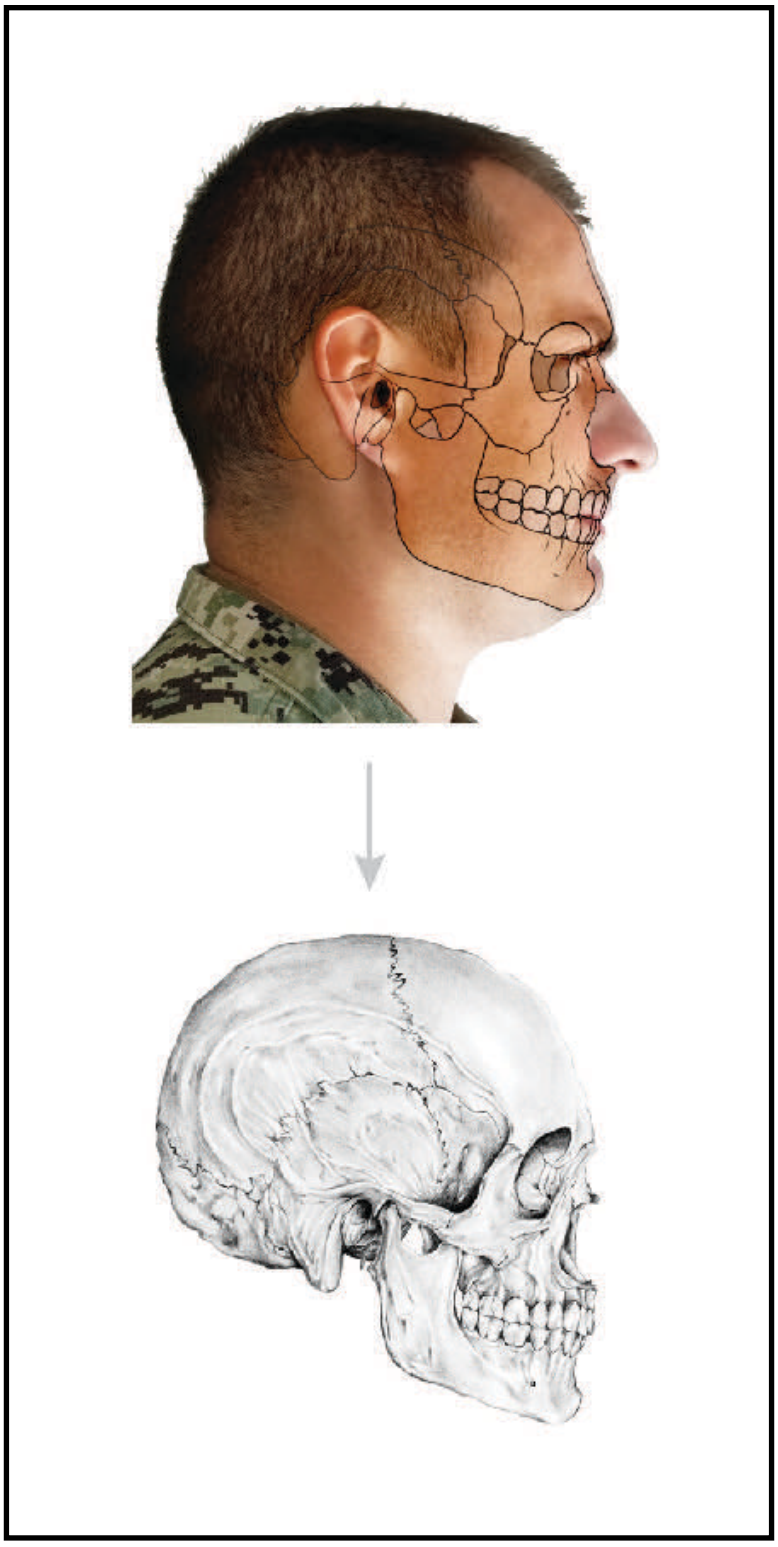

Figure 24: The Caucasoid Skull; Above is a picture of a white male that shows a drawing of what his skull might look like below it. The comparison chart in Figure 27 highlights the differences between each skull-type.

There are many universal characteristics of the Mongoloid race. When describing their appearance, the author continued further and wrote, “In profile, the Mongoloid skull indicates an often flattened face with a short cranial vault or distance from front to back. Frontally, the cheek area is usually quite wide with projecting zygomatic bones. The width of the nose opening or nasal aperture is usually somewhere between the Caucasoid and the Negroid. Mongoloid mouths may also be of a size somewhere between the Caucasoid and the Negroid” (Taylor, 2001). I identified the aforementioned physical features on many Asian passengers at the IIA. An example of the head and skull of a Mongoloid male is shown in the figure below.

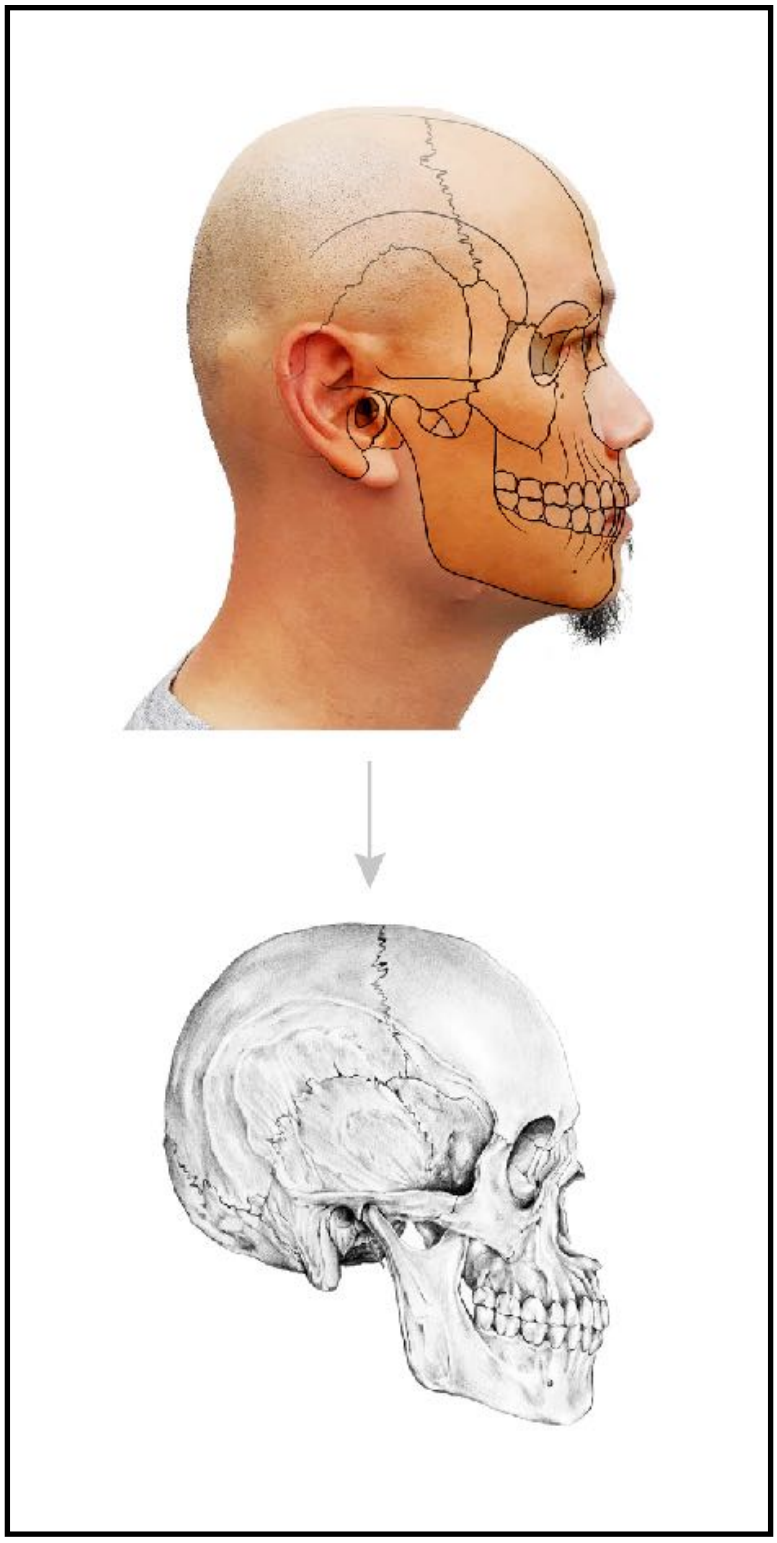

Figure 25: The Mongoloid Skull; Above is a picture of an Asian male that shows a drawing of what his skull might look like below it. The comparison chart in Figure 27 highlights the differences between each skull-type.

When studying the Negroid race, the author wrote, “In profile, the Negroid skull often exhibits alveolar prognathism, which is expressed as a projection of the lower face. Frontally, the nasal openings tend to be wider and shorter than in Caucasoids and Mongoloids, with a bridge that is broader and flatter. Negroid mouths tend to be broader with fuller everted lips. Many negro people also have wider set eyes than the other groups” (Taylor, 2001). I confirmed these characteristics by looking at myself in the mirror and studying the faces of my relatives. In my opinion, negroid facial features can be easily distinguished from those of Caucasoid and Mongoloid decent. Not only are the underlying structures of the skull strikingly different, but there are also obvious differences in the skin tone and hair texture of Negroid individuals as well.

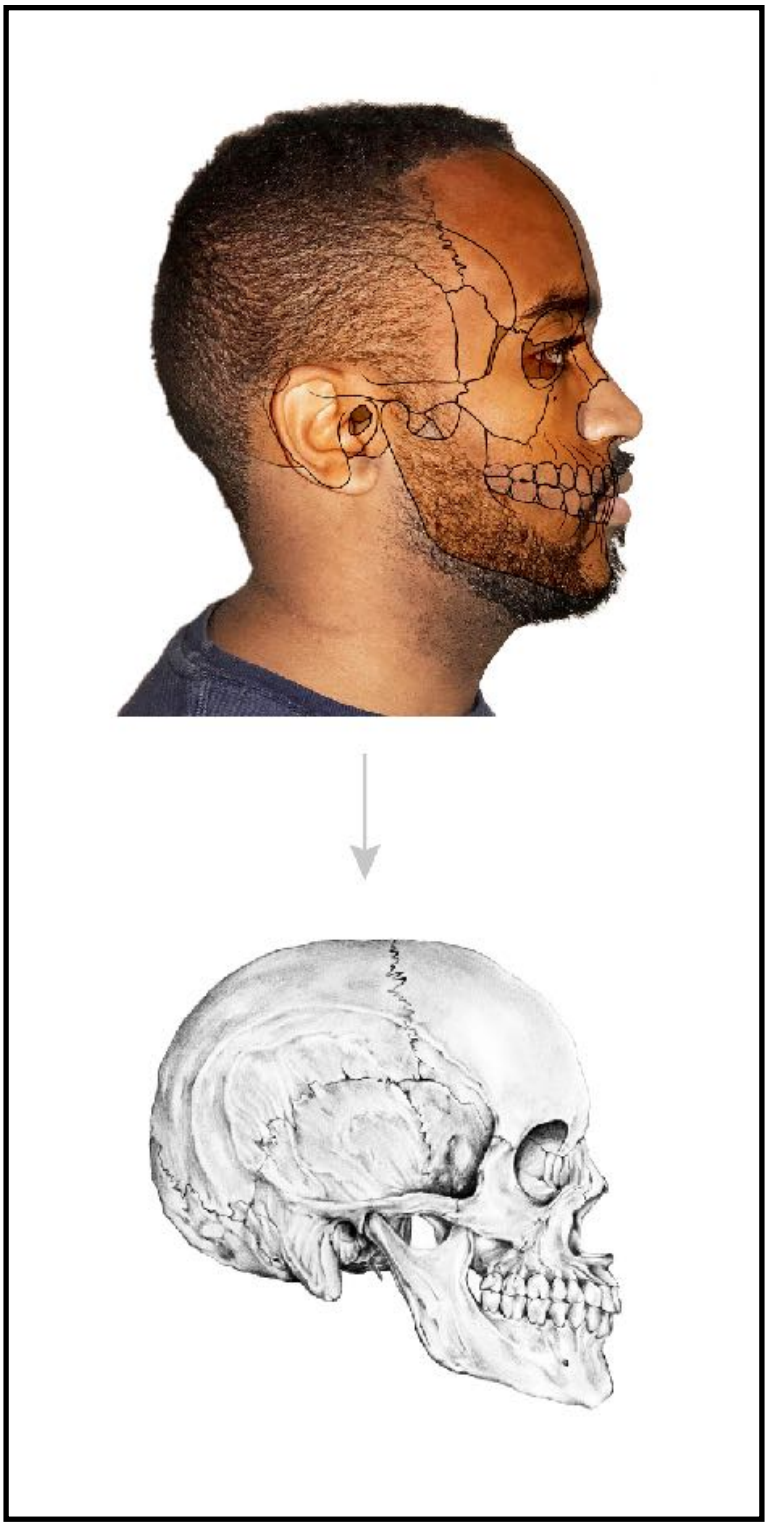

Figure 26: The Negroid Skull; Above is a picture of a black male that shows a drawing of what his skull might look like below it. The comparison chart in Figure 27 highlights the differences between each skull-type.

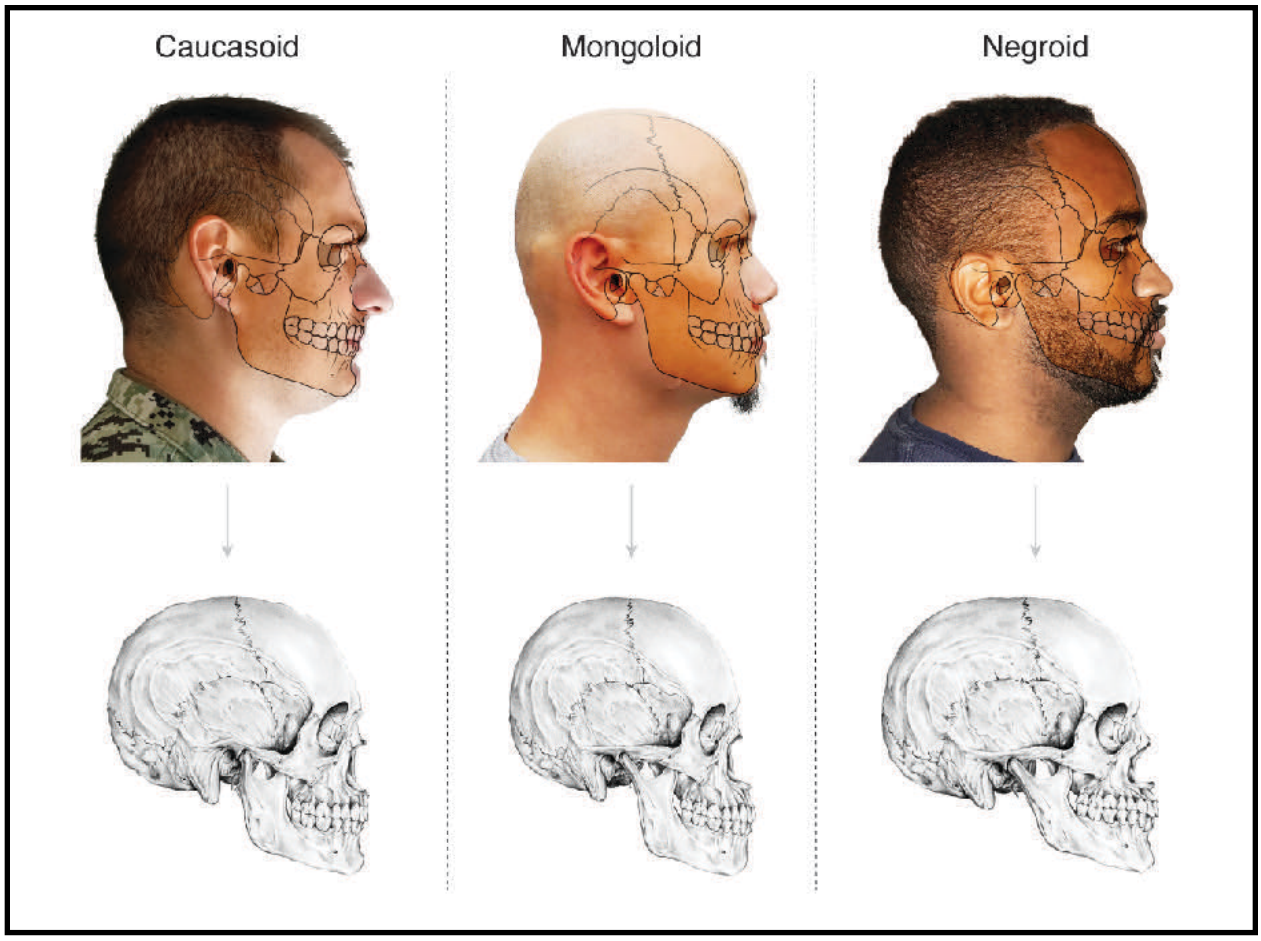

Figure 27: Skull Comparison Chart; The face of the Caucasoid skull is flatter than the face of the Negroid skull. However, the face of the Mongoloid skull is the flattest. From a lateral view, the Negroid skull is the widest of the three skulls and it is extremely round. Furthermore, the frontal bone on each skull is sloped at a different angle. Notice that the angle of the zygomatic arch on each skull is also different.

Conclusion:

Forensic art is a highly specialized career field for artists who have been trained appropriately. Forensic artists should possess both artistic ability and scientific knowledge of the human body to accurately render people of different ages, gender, and race. Understanding the human body, written law, and law enforcement policies and procedures is crucial. Portfolios should exhibit realistic anatomical drawings, illustrations, or sculptures to showcase both artistic talent and scientific knowledge.

It is not easy to become a forensic artist. Full-time positions are limited, but working for a law enforcement agency is a huge step forward in the career process. In the meantime, artists can stay up-to-date with current forensic art methods and techniques by continuing to draw, sculpt, and study human anatomy. Attending workshops and networking is also very helpful. This will prepare forensic artists for employment when positions becomes available.

Overall, a career in forensic art can be extremely rewarding. Capturing a fugitive from justice, or identifying the remains of a missing loved-one, can bring closure to a grieving family. The impact forensic art has had on society in the last two centuries has been extraordinary. One successful forensic artist wrote, “Many law enforcement officers have come to know the power of forensic art. They have seen a composite drawing lead to the perpetrator they seek, or a facial reconstruction help reveal the identity of a homicide victim. Age progressions help officers recover abducted children and locate fugitives who have been at large for many years. Many have witnessed the profound impact and clarity that forensic art can bring to court proceedings” (Taylor, 2001). This is the type of impact I want my artwork to have on society. Until that day comes, I will continue to educate other artists about this unique career field and continue training.

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