



## IMPORTANCE OF FORENSIC FACIAL RECONSTRUCTION IN CRIME INVESTIGATION IN INDIA

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### ABSTRACT

Improper and unscientific investigation of crime by police has been pointed out to be one of the major reasons for lower conviction rate in our country. To increase the conviction rate, present government has been making efforts in capacity building and promotion of forensic science in India. Our criminal justice system needs to be integrated with forensic science-based investigation to give better results. Certainly, there has been transition from application of traditional typical methods to scientific methods, for the purpose of crime investigation by the police authorities. However, there is a long road yet to be traversed. One of the contributions of science and technology for aiding in identification of otherwise unidentifiable bodies, decomposed bodies, disfigured faces, skeletal remains, is the technique of facial reconstruction. This technique is supposed to help in recreating facial features of unidentified individuals through skeletal remains. The author in her paper has tried to throw light on the importance of forensic facial reconstruction. Superimposition, which is one of the forms of facial reconstruction has been highlighted in the paper with examples of instances in India, wherein, this technique has provided a breakthrough in crime investigations.

### I. Introduction

*“In forensic science, everything is a clue, and every clue is a potential breakthrough.”*

- Jefferson Bass<sup>1</sup>

Forensic science is the art which involves application of scientific principles to crime investigation<sup>2</sup>. It perceives everything around, to be a clue or a tell-tale sign when seen in the context of commission of a crime, or identity of accused or the victim of crime. Every such

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<sup>1</sup> ‘Jefferson Bas’ depicts the writing partnership between Dr. Bill Bass and Jon Jefferson, and is their pen name. Dr. Bass is a world-renowned forensic anthropologist, who had established the Anthropology Research Facility (the ‘Body Farm’) at the University of Tennessee around 25 years ago. He is the author or coauthor of over 200 scientific articles, as well as *Death's Acre*, a critically praised memoir about his career. Jefferson is an accomplished journalist, author, and a documentary filmmaker. His work has appeared in the *New York Times*, *Newsweek*, *USA Today*, *Popular Science*, and *National Public Radio*. He is the author or co-author of over 200 scientific articles, including *Death's Acre*, and the writer and producer of two National Geographic programmes about the Body Farm. See *Fantastic Fiction*, “Jefferson Bass”, available at: <https://www.fantasticfiction.com/b/jefferson-bass/> (last visited on Aug. 10, 2023).

<sup>2</sup> Anil K. Jain and Arun Ross, “Bridging the gap: from biometrics to forensics” 370 *Philosophical Transactions of Royal Society B*. 3 (2015).

clue or a sign, may provide a potential breakthrough in solving a criminal case.<sup>3</sup> An expert who testifies before the court plays an important role, more so because the entire purpose behind this exercise is to assist the court to form its opinion. This opinion could deal with questions concerning foreign law, science, art, and other areas which the court may lack the technical expertise to form an opinion on its own<sup>4</sup>. Such questions in criminal cases may touch upon areas such as ballistics, fingerprints, handwriting comparison, and even DNA testing or superimposition techniques<sup>5</sup>.

Amongst the various known branches of forensic science, ‘Forensic Anthropology’ is also one. It helps in solution of legal issues in which humans, their dead bodies, skeletons, bones, or their fragments are involved<sup>6</sup>. The main aspect or division of anthropology that helps in the process of dissemination of justice is recognized as physical anthropology. Physical Anthropology mainly focusses on the physical aspects of human body, its characteristics, developments, and the changes which continue to take place in the body, even after death of a person<sup>7</sup>. Such characteristics of a human body, and the development and changes in them, provide a Forensic Anthropologist with the requisite evidentiary clues to assist the courts in deciding anthropological issues in criminal and civil cases. In a way, forensic anthropology is an important sub-field of physical anthropology<sup>8</sup>.

Over the years, technology has played a critical role in enhancing forensic science, notably in modern-day criminal investigations. Significant improvements in forensic equipment and devices in recent years have enabled investigators to capture and analyze evidence more efficiently than ever before. The police have used a range of methods to aid their investigations, ranging from technology such as Call Data Records to DNA tests<sup>9</sup>. In recent times, the technique of forensic facial reconstruction has proven to be extremely useful in criminal cases where there are no clues or tell-tale signs to track a person whose face has

<sup>3</sup> Joseph Peterson, Ira Sommers, *et.al.*, “The Role and Impact of Forensic Evidence in the Criminal Justice Process” 2, 17 (Sep., 2010), *available at*: <https://www.ojp.gov/pdffiles1/nij/grants/231977.pdf> (last visited on Aug. 03, 2023).

<sup>4</sup> The Indian Evidence Act, 1872 (Act No. 1 of 1872), s. 45.

<sup>5</sup> *Pattu Rajan v. State of Tamil Nadu* (2019) 4 SCC 771 at 790.

<sup>6</sup> H. James Birx, “Forensic Anthropology” in *Encyclopedia Britannica*, Apr. 12, 2023, *available at*: <https://www.britannica.com/science/forensic-anthropology> (last visited on Aug. 04, 2023).

<sup>7</sup> Luis Fondebrider, “Forensic Anthropology: Definition” in Claire Smith (ed.), *Encyclopedia of Global Archaeology* (Springer, New York, 2014).

<sup>8</sup> National Museum of Natural History, “Forensic Anthropology”, *available at*: <https://naturalhistory.si.edu/education/teaching-resources/social-studies/forensic-anthropology#:~:text=When%20human%20remains%20or%20a,hard%20tissues%20such%20as%20bones>. (last visited on Aug. 04, 2023).

<sup>9</sup> Mohamed Thaver, “Explained: Importance of Forensic Facial Reconstruction in crime investigation” *The Indian Express*, May 20, 2019.

been destroyed or bodies that have deteriorated due to passage of time<sup>10</sup>. Herein, superimposition techniques are used for the purpose of identification of the suspected victim from the skull photograph and the life-size photographs of such victim. Life-size photos of the head of the deceased and transparency of the skull are superimposed. In the case of identity, the positions of the nose, eyes, ears, and the chin will correspond, whereas, in the case of non-identity, the various positions do not superimpose.<sup>11</sup> Specific points are to be measured and compared, during the comparison of facial features of ante-mortem life-size photograph and morphology of the skull, viz., ‘eyebrows, medial margins of the slit, lateral margin of eyes, position of moustache, position of closed mouth, face outline, nasion, position of ear, position of nostrils, height of nose, width of nose, width of mouth, maximum width of the nasal bridge, and lip height’<sup>12</sup>.

Recently, the Union Minister for Home Affairs and Cooperation, Shri Amit Shah, had highlighted the concern regarding the low conviction ratio in our country even after 75 years of independence<sup>13</sup>. According to the 239<sup>th</sup> Report of the Law Commission of India<sup>14</sup>, one of the major factors contributing to low conviction rates is ‘improper and unscientific police investigation’<sup>15</sup>. To achieve the goal of a conviction rate above 90%, the current government has taken various steps to enhance forensic science and promote forensic based criminal investigations. An important provision has been added in the *Bharatiya Nagarik Suraksha Sanhita Bill, 2023*<sup>16</sup>, towards this end. The Bill makes forensic investigations to be compulsory, for crimes punishable with at least seven years of imprisonment<sup>17</sup>. In all such cases, it will be mandatory to have a forensic expert to visit the crime scene to collect

<sup>10</sup> Comparing skull features to antemortem pictures of a head and/or face is the craniofacial superimposition method. Forensic scientists utilise this procedure when a positive identification cannot be achieved but authorities assume the recovered skull belongs to a certain missing person [Douglas H. Ubelaker, Yaohan Wu, *et.al.*, “Craniofacial photographic superimposition: New developments” 1 *Forensic Science International: Synergy* 271 (2019)].

<sup>11</sup> B R Sharma, *Forensic Science in Criminal Investigation & Trials* 1349 (LexisNexis, Gurgaon, 6th edn., 2020).

<sup>12</sup> *Id.* at 1351.

<sup>13</sup> Press Information Bureau Delhi, “Union Home Minister and Minister of Cooperation, Shri Amit Shah introduces the Bhartiya Nyaya Sanhita Bill 2023, the Bharatiya Nagarik Suraksha Sanhita Bill, 2023 and the Bharatiya Sakshya Bill, 2023 in the Lok Sabha, today” (Ministry of Home Affairs), Aug. 11, 2023, *available at*:

<https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1947941#:~:text=Prime%20Minister%20Shri%20Narendra%20Modi%20has%20taken%20a%20historic%20decision,conviction%20ratio%20above%2090%20percent.> (last visited on Aug. 15, 2023).

<sup>14</sup> Law Commission of India, “239<sup>th</sup> Report on Expedient Investigation and Trial of Criminal Cases Against Influential Public Personalities-Submitted to the Supreme Court of India in W P (C) NO. 341/2004, *Virender Kumar Ohri v. Union of India & Others*” (March, 2012).

<sup>15</sup> *Id.* at 12.

<sup>16</sup> Bill No. 122 of 2023.

<sup>17</sup> *Id.*, s. 176.

forensic evidence. The expert will be required to record the process on any electronic device, including mobile phone. In cases where a particular state does not have a forensics facility, forensic facility in another state shall be used. By following such practices, the prosecutors will have access to scientific evidence, and the culprits' chances of getting acquitted in court will be considerably reduced<sup>18</sup>.

## II. Forensic Facial Reconstruction: Meaning, Scope and Origin

*“Out of the great number of faces that have been formed since the creation of the world, no two have been so exactly alike, but that the usual and common discernment of the eye would discover a difference between them.”*

- William Hogarth<sup>19</sup>

There are no two human faces that are alike, not even the faces of identical twins<sup>20</sup>. A human face is suggestive of details such as age, gender, health, ethnic group, to name a few. We are all capable of detecting the slightest differences between faces, and it is this skill that enables us to perform personal recognition and identification.<sup>21</sup>

### Forensic Facial Reconstruction: Meaning and Scope

Forensic Facial Reconstruction is the study of the skull to recreate lost or unknown facial features of a deceased person. Forensic facial reconstruction involves recreation of the face of a generally unidentified individual, from his/her skeletal remains; the entire process is a blend of ‘artistry, forensic science, anthropology, osteology, and anatomy’<sup>22</sup>. When there are unidentified remains in a crime scene, it is mostly used to determine identities. The approach compares specific spots on the skull to an existing image. It is an old procedure that is now mostly executed by computers.<sup>23</sup> Forensic facial reconstruction is a quick, non-invasive, and efficient procedure that can be repeated at any time if necessary. This technique is utilized not just for identifying persons from skeletal remains, but also for archaeological purposes.

<sup>18</sup> *Supra* note 13.

<sup>19</sup> William Hogarth, *The Analysis of Beauty* 123 (John Reeves, London, 1753), available at: [https://archiv.ub.uni-heidelberg.de/artdok/1217/1/Davis\\_Fontes52.pdf](https://archiv.ub.uni-heidelberg.de/artdok/1217/1/Davis_Fontes52.pdf) (last visited on Aug. 03, 2023).

William Hogarth was a famous English painter and an engraver; his moral and satirical engravings and paintings are his most well-known works (See Britannica, “William Hogarth: English Artist”, available at: <https://www.britannica.com/biography/William-Hogarth> (last visited on Aug. 03, 2023).

<sup>20</sup> Caroline Wilkinson, *Forensic Facial Reconstruction* 5 (Cambridge University Press, United Kingdom, 2004).

<sup>21</sup> *Ibid.*

<sup>22</sup> Sonia Gupta, Vineeta Gupta, *et.al.*, “Forensic Facial Reconstruction: The Final Frontier” 9(9) *Journal of Clinical & Diagnostic Research* 26 (Sep., 2015).

<sup>23</sup> Renowned Forensic Expert, Rukmani Krishnamurthy, as cited in Swati Deshpande, “Sheena Bora case: How skull-face superimposition process identified remains” *The Times of India*, Nov. 25, 2015.

Visual identification by the family of an individual and his/her associates becomes simpler and more definite.<sup>24</sup>

Facial reconstruction is generally classified into four categories: i) replacement and repositioning of destroyed or distorted soft tissues onto a skull; ii) utilization of photographic transparencies and drawings in an identikit-type system<sup>25</sup>; (iii) graphic, photographic or video superimposition; (iv) plastic or three-dimensional reconstruction of a face over a skull, with the help of sculpting clay<sup>26</sup>. Facial reconstruction, whether it is through sketch, sculpted, superimposed or computer-generated from skeletonized remains, gives a face to the faceless or the otherwise unidentifiable<sup>27</sup>.

Facial recognition and reconstruction is a rapidly growing field with many applications. It is a great instrument that is frequently utilized in criminal investigation. During the course of the previous two decades, there has been a significant evolution and advancement in the field of facial recognition and reconstruction.<sup>28</sup> The term facial reconstruction is generally used interchangeably as ‘facial approximation’, which indeed seems to be a more accurate term, as it is not possible to achieve exact appearance, because there are some features which can not be predicted just on the basis of skull. The forensic expert, in best case, can only approximate to the real appearance.<sup>29</sup> The listed anthropometric measurements of the actual skull, life-size photograph, and ante-mortem life-size photograph of the person are taken and super-imposed *inter se* for a match or non-match: ‘total face height, face width, upper face height, lower part face width, nasal aperture – height and width, intra orbital width, and orbital – height and width’<sup>30</sup>.

Facial reconstruction is frequently used as a last resort after other methods of identification have failed<sup>31</sup>, and it must be supported by radiographic, dental, or DNA evidence to be

<sup>24</sup> *Supra* note 22 at 28.

<sup>25</sup> See Central Intelligence Agency, “The Identi-Kit”, available at: <https://www.cia.gov/static/The-Identi-Kit.pdf> (last visited on Aug. 15, 2023).

<sup>26</sup> W A Aulsebrook, M Y Işcan, *et.al.*, “Superimposition and reconstruction in forensic facial identification: a survey” 75(2-3) *Forensic Science International* 101 (Oct. 30, 1995).

<sup>27</sup> Karen T. Taylor, *Forensic Art and Illustration* (CRC Press, USA, 2001) as cited in Jenny Omstead, “Facial Reconstruction” 10(1) *Totem: The University of Western Ontario Journal of Anthropology* 37 (2002).

<sup>28</sup> Ankita Guleria, Kewal Krishan, *et.al.*, “Methods of forensic facial reconstruction and human identification: historical background, significance, and limitations” 110(2) *Naturwissenschaften* 8 (Feb., 2023).

<sup>29</sup> Ryan M. Campbell, Gabriel Vinas, *et.al.*, “Towards the restoration of ancient hominid craniofacial anatomy: Chimpanzee morphology reveals covariation between craniometrics and facial soft tissue thickness” 16(6) *PLoS ONE* 2 (2021).

<sup>30</sup> *Supra* note 11 at 1350.

<sup>31</sup> See *State of Assam v. Upendra Nath Rajkhowa*, 1975 Cr LJ 354.

considered a positive identification<sup>32</sup>. It would not be incorrect to state that, this procedure is used in forensic science to identify an individual when traditional methods of identification have failed. For instance, in the celebrated case of Sheena Bora, wherein the mother was alleged to have committed the murder of her own daughter, digital superimposition techniques, amongst others, were applied to determine the identity of the skull<sup>33</sup>. It was a very contentious and cruel occurrence that goes back to April of 2012, when Indrani Mukerjea (who was the mother of the deceased Sheena), her then-driver Shyamvar Rai, and her husband Sanjeev Khanna allegedly strangled Sheena Bora, aged 24 years, to death in a car. Following that, the body was burned in a jungle in Raigad district of Maharashtra.<sup>34</sup> DNA analysis, forensic odontology, and digital superimposition techniques were used in this case to determine the identity of the skull<sup>35</sup>.

The superimposition technique is used to identify a dead body whose face has degraded beyond recognition. The approach is based on the idea that the contour of the face is dictated by the bones behind it in the skull. The width of the forehead, for example, is determined by the size of the frontal bone in the skull. Similarly, the shape of the upper lip is determined by two maxillae that support the upper lip; the shape of the chin is determined by the size and shape of the mandible, which is the lower jaw bone in the skull. The technique can only be used if a current photograph of a deceased individual is available. Such photograph is superimposed on the skull image. It should be noted that the superimposition technique can only be utilized as corroborative evidence and not as substantive piece of evidence.<sup>36</sup>

The *Daubert*<sup>37</sup> standard<sup>38</sup> is a legal precedent which has been established by the United States Supreme Court in 1993, to govern the question of admissibility of the findings of an expert, during legal proceedings. When many forensic artists make approximations based on the same set of skeletal remains, no two reconstructions are will ever be identical. It has also been found that the data which is used to create these approximations is often insufficient. As a result, forensic facial reconstruction violates the *Daubert* standard, and is therefore, not one

<sup>32</sup> Adarsh Kumar and Tulika Banerjee, "Importance of Facial Reconstruction in Forensics", available at: [https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp\\_content/S000016FS/P001353/M019178/ET/1516254407/FSC\\_P11\\_M26\\_e-text.pdf](https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000016FS/P001353/M019178/ET/1516254407/FSC_P11_M26_e-text.pdf) (last visited on Aug. 04, 2023).

<sup>33</sup> See Swati Deshpande, "BHU professor 'proves' in court Pen skull is Sheena Bora's" *The Times of India*, Jan. 04, 2020.

<sup>34</sup> Ishika Yadav, "Sheena Bora murder case: A timeline of twists and turns" *Hindustan Times*, May 18, 2022.

<sup>35</sup> *Supra* note 33.

<sup>36</sup> See The Editorial Note appended to *Inspector of Police, Tamil Nadu v. John David* (2011) 5 SCC 509.

<sup>37</sup> *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 43 F.3d 1311 (9th Cir. 1995).

<sup>38</sup> Legal Information Institute, Cornell Law School, "Daubert Standard", available at: [https://www.law.cornell.edu/wex/daubert\\_standard#:~:text=Established%20in%20the%201993%20U.S.,%22gatekeepers%22%20of%20scientific%20evidence.](https://www.law.cornell.edu/wex/daubert_standard#:~:text=Established%20in%20the%201993%20U.S.,%22gatekeepers%22%20of%20scientific%20evidence.) (last visited on Aug. 10, 2023).



of the legally recognized procedures for positive identification. Since reconstructions fail to satisfy the rule laid down in *Daubert*, they are currently only made to aid the process of positive identification, when used alongiwth other proven procedures<sup>39</sup>. In other words, according to some reviewers, forensic facial reconstruction is a method of facial approximation, which means that several facial patterns can be generated from the same skull. On the other hand, the other set of researchers, are of the belief that each skull could only produce one face, which would lead to positive identification of an individual; hence, the name “Facial Reconstruction” was coined<sup>40</sup>.

### **Origin and Evolution of Forensic Facial Reconstruction**

Making faces, or facial reconstruction, has an old history. Scientists in ancient Egypt worked hard to retain as many details about their ancestors as possible. Excavations in Jericho in 1953 uncovered the earliest examples of facial reconstruction. Plaster heads with shells inserted into eye sockets to imitate eyes were discovered beneath the floors of buildings dating from 7500 to 5500 BC.<sup>41</sup>

Forensic facial reconstruction began as an art form until individuals realized its utility as a science form. Hermann Welcker (1883)<sup>42</sup> and Wilhelm His (1895)<sup>43</sup> were the first ones to recreate three-dimensional facial approximations based on remains of the human skull. Most sources, however, credit His as the pioneer in developing the approach. His also produced the first data on average face tissue thickness, which was followed by Kollmann and Buchly<sup>44</sup>,

<sup>39</sup> Aditya Singh, “An Overview of Forensic Facial Reconstruction” 13(7) *Journal of Forensic Research* 1 (2022). Also See Erica Beecher-Monas, “Blinded by Science: How Judges Avoid the Science in Scientific Evidence” 71 *Temple Law Review* 55-102 (1998).

<sup>40</sup> *Supra* note 22.

<sup>41</sup> Ch. Stavrianos, I. Stavrianou, *et.al.*, “An Introduction to Facial Reconstruction” 11 *Balkan Journal of Stomatology* 76 (2007).

<sup>42</sup> Hermann Welcker was a German anatomist and anthropologist who was born in Germany on April 08, 1822 and died on September 09, 1897. He was trained in anatomy and was particularly interested in deciphering a person’s face based on the shape and form of their skull. Welcker postulated in 1883 that the shape of muscles and soft tissue on face of a person might be characterized and placed on an actual skull to get an impression of what that individual looked like originally. This procedure provided the foundation for both criminal and anthropological forensic face reconstruction today [Guinness World Records, “First forensic facial reconstructions”, *available at*: <https://www.guinnessworldrecords.com/world-records/first-use-of-forensic-facial-reconstructions> (last visited on Aug. 10, 2023)].

<sup>43</sup> Wilhelm His (1831–1904) was a Swiss-born physician who pursued a career in embryological and anatomical research in Basel and then Leipzig. He created an early example of forensic craniofacial reconstruction, using the presumed skeleton remains of Johan Sebastian Bach, a German composer [Michael K. Richardson and Gerhard Keuck, “The revolutionary developmental biology of Wilhelm His, Sr.” 97(3) *Biological Reviews* 1131-1160 (June, 2022)].

<sup>44</sup> Kollmann and Buchly also made a facial approximation of Dante in 1898 from the tissue depth measurements. Kollman then went on to reconstruct the face of a stone-age woman from Auenir, France, which became known as the first scientific reconstruction, by producing technical drawings from tissue depth measurements of hundreds of women in the area, with finishing touches provided by Buchly [See Rinchon S., Arpita S., *et.al.*, 3D Forensic Facial Reconstruction: A Review of the Traditional Sculpting

who later collected additional data and compiled tables that are still used in most facial reproduction laboratories today<sup>45</sup>. Mikhail Gerasimov<sup>46</sup>, a 20th-century Russian archaeologist, and anthropologist, was known to have researched skulls and precisely rebuilt the faces of excavated *homo sapiens* to middle-aged kings, including the Mongol conqueror Timur<sup>47</sup>. Although well known, facial reconstruction was not frequently used as a forensic tool until the mid-1900s, when it was used along with photo superimposition to identify victims of World War II concentration camps<sup>48</sup>.

The prosecution of Buck Ruxton, famously known as ‘Jigsaw Murders’ case<sup>49</sup>, was amongst one of the first important cases, in which the two victims who were the wife and housemaid of the accused, were identified with the help of skeletal remains through the superimposition of photographs. The technique proved to be effective in the distinction and identification of the two slain ladies.<sup>50</sup> Since its introduction in this case, the technique has been extensively used. In contemporary times, computers have made the entire process of superimposition much faster; the accuracy of the process has also improved many times.

### III. Procedure involved in Forensic Facial Reconstruction

Two main facial reconstruction techniques have been recognized, *viz.*, two-dimensional (2D) and three-dimensional (3D)<sup>51</sup>. Each technique is further classified as manual or computerized, *i.e.*, by using a particular software. The 2D technique is categorized into sketching and computerized, and the 3D technique is categorized into claying and computerized. The 2D reconstruction technique is used to reconstruct a face from the skull using soft tissue depth

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Methods and Recent Computerised Developments” 3(1) *International Journal of Forensic Sciences* 2 (2018)].

<sup>45</sup> Encyclopedia, “Forensic facial reconstruction”, available at: [https://www.bionity.com/en/encyclopedia/Forensic\\_facial\\_reconstruction.html#\\_note-Rhine/](https://www.bionity.com/en/encyclopedia/Forensic_facial_reconstruction.html#_note-Rhine/) (last visited on Aug. 10, 2023).

<sup>46</sup> Professor Michail Gerasimov, a Russian palaeontologist, has often been referred as ‘father of facial reconstruction technique’. He established the Russian method of facial reconstruction in 1924, which emphasizes the development of the musculature of the skull and neck as being significant. Gerasimov worked on the faces of the earliest known fossil men, *Neanderthaloid* and *Pithecanthropus*, and rebuilt over 200 skulls of our prehistoric ancestors. He also had the opportunity to put his expertise to use by solving murder cases (*Supra* note 41 at 77).

<sup>47</sup> *Supra* note 9.

<sup>48</sup> *Supra* note 27 at 38.

<sup>49</sup> *Rex v. Buck Ruxton* (1935).

<sup>50</sup> See Robertson Crichton, “Rex v. Buck Ruxton Manchester Winter Assizes, 1936” 4(2) *Medico-Legal and Criminological Review* 144-158 (1936); R.H. Blundell and G. Haswell Wilson (eds.), *Trial of Buck Ruxton* (William Hodge and Company Limited, Great Britain, 1937), available at: [https://ia902908.us.archive.org/5/items/in.ernet.dli.2015.173614/2015.173614.Trial-Of-Buck-Ruxton\\_text.pdf](https://ia902908.us.archive.org/5/items/in.ernet.dli.2015.173614/2015.173614.Trial-Of-Buck-Ruxton_text.pdf) (last visited on Aug. 10, 2023).

<sup>51</sup> Pagorn Navic, Chanatporn Inthasan, *et.al.*, “Facial reconstruction using 3-D computerized method: A scoping review of Methods, current Status, and future developments” 62 *Legal Medicine* (May 2023), available at: <https://www.sciencedirect.com/science/article/abs/pii/S1344622323000494> (last visited on Aug. 04, 2023).



estimates. Karen Taylor<sup>52</sup> pioneered this technique in the 1980s in Austin, Texas. This procedure, which is based on antemortem pictures and the skull which is to be reconstructed, requires an artist and a forensic anthropologist to collaborate on facial reconstruction<sup>53</sup>.

Anatomical, anthropometrical, and combination approaches are among the 3D manual (claying) methods. Anatomical approach is the Russian method of facial reconstruction, anthropometrical approach is American method, whereas, combination approach is British method of manual facial reconstruction. Variance in nomenclature has resulted from difference in approach (discipline-specific) as well as different regional origins. The anatomical method, developed by Mikhail Mikhaylovich Gerasimov<sup>54</sup>, relies on the primary influence of muscles in constructing facial form and features; the anthropometrical method, developed by Wilton M. Krogmann<sup>55</sup>, emphasizes upon average facial tissue depths in facial depiction rather than the anatomical relationship between skull and facial structure. The combination approach, as developed by Richard Neave<sup>56</sup> in the year 1977, combines the anatomical and anthropometrical approaches, in which average soft tissue outlines serve as confirmation of structural details offered by muscle and bone morphology.

Manual reconstruction approaches have been mostly replaced by computers. The computer is fed with the skull structural data, and other facial feature data and cranial structure are created in 3D on the monitor with special software. The flesh-like facial features are produced and sculpted using depth and thickness data previously stored in the computer. The obtained facial figure is digitised, and the resulting data is compared to similar data created with the suspected subject. The automated reconstruction has not only sped up the procedure but also

<sup>52</sup> Karen T. Taylor is an author, art educator, portrait sculptor, forensic artist, and facial identification specialist. She has contributed towards solving of criminal cases for numerous law enforcement organisations worldwide [Behance, “Karen T. Taylor”, available at: <https://www.behance.net/karentaylor> (last visited on Aug. 14, 2023)].

<sup>53</sup> Arpan Manna, Tanha Khan, *et.al.*, “Facial Reconstruction: A Boon to forensic practice” 5(1) *International Journal of Forensic Medicine* 22 (2023).

<sup>54</sup> *Supra* note 44.

<sup>55</sup> Dr. Krogmann, an American Anthropologist, was amongst the pioneers of forensic and physical anthropology in the US. Over the course of his remarkable career, which lasted almost six decades, he gained widespread admiration and respect for his , scholarship, teaching, research, wit, and humanism. Although skeletal remains studies have long been utilized to support the medicolegal system, it was Krogmann who brought these fields together to evolve the field of forensic anthropology [M.Y. Iscan, “Wilton Marion Krogman, Ph.D. (1903-1987): the end of an era” 33(6) *Journal of Forensic Science* 1473 (Nov., 1988)].

<sup>56</sup> Richard Neave is a forensic facial reconstruction expert from the United Kingdom. He is credited with the development of Manchester Technique of Forensic Facial Reconstruction (combination method) at the University of Manchester in the UK between 1973 and 1980 [New Scientist, “I Know that Face”, Nov. 23, 2016, available at: <https://www.newscientist.com/lastword/mg23231011-500-i-know-that-face/> (last visited on Aug. 20, 2023)].

boosted its accuracy significantly. It is also more manoeuvrable.<sup>57</sup>

#### IV. Breakthrough in Crime Investigation Through Forensic Facial Reconstruction

The usage of superimposition technique for investigation of crimes in Indian subcontinent is not a new phenomenon. The same was pointed out by the Hon'ble Supreme Court of India in the case of *Pattu Rajan v. State of Tamil Nadu*<sup>58</sup>. The technique has managed to provide breakthrough in many investigations, especially those pertaining to the Nithari murders (2006), the Morni Hill murder case and the Paharganj bomb blast case<sup>59</sup> (1996), the Udampur murder case (2005), and the Russian murder incident in Goa (2008).<sup>60</sup>

In the well-known Nithari case, police authorities had the challenge in determining the identification of skulls discovered in the drain. The investigative agency then chose to go for DNA tests, facial reconstruction, and facial superimposition on all skulls found. In 2006, Noida police had sent 19 skulls and DNA samples to Forensic Science Laboratory (FSL), Chandigarh for testing. The DNA experts at the FSL, namely, Dr. Sanjiv and Dr. Rajiv Giroti, used superimposition and 3D techniques to identify 16 children.<sup>61</sup>

In the Morni Hill murder case, three young people went to Morni Hills and consumed alcohol and drugs. Late in the evening, they got into a fight, and one of them was strangled to death by the other two. The deceased body was dumped in ravines that are rarely visited by humans. The skeleton of the deceased was found after a long time. The identification of the victim was established with the help of skull superimposition.<sup>62</sup>

Maria Monica Susairaj, an aspiring model and actor, and her partner, former navy officer Emile Jerome, were arrested in 2008 on suspicion of plotting the death of creative ad director, Neeraj Grover. He was supposedly stabbed to death, his body was dismembered, and his remains were burned in the forest by the two accused. Finally, his skull had to be sent for facial reconstruction in order to confirm his identity.<sup>63</sup>

<sup>57</sup> P. Vanezis, R.W. Blowes, *et.al.*, "Application of 3-D computer graphics for facial reconstruction and comparison with sculpting techniques" 42(1-2) *Forensic Science International* 69-84 (July, 1989).

<sup>58</sup> *Supra* note 5 at 791.

<sup>59</sup> See John F. Burns, "Kashmiri Separatists Claim Delhi Bomb That Killed 17" *The New York Times*, April 22, 1996, available at: <https://www.nytimes.com/1996/04/22/world/kashmiri-separatists-claim-delhi-bomb-that-killed-17.html> (last visited on Aug. 12, 2023).

<sup>60</sup> See Justice K. Kannan (ed.), *Modi: A Textbook of Medical Jurisprudence and Toxicology* 267-271 (LexisNexis, 26<sup>th</sup> edn., 2018).

<sup>61</sup> Tanseem Haider, "Sheena Bora can be identified with help of 2D facial reconstruction: Forensic experts" *India Today*, Sep. 02, 2015.

<sup>62</sup> *Supra* note 11.

<sup>63</sup> Headlines Today Bureau, "Susairaj, Jerome guilty in Neeraj Grover murder case" *India Today*, June 30, 2011.

In the year 2020, a forensic science professor from BHU<sup>64</sup> testified as a witness of CBI in court that, using digital superimposition, which was a type of forensic facial reconstruction, he had established that the skull recovered in the Sheena Bora murder case was a complete match with her smiling photographs. The match was based on ‘facial landmarks’<sup>65</sup> and teeth. Four different perspectives or angles of Sheena’s photographs were chosen for forensic identification. Corresponding skull photos were chosen. A software was used to do the superimposition. In addition, forensic odontology<sup>66</sup> was used to compare exactness in superimposition over visible teeth of the victim in order to achieve precise superimposition.<sup>67</sup> Recently, the Mumbai Police opted to go for the forensic facial reconstruction technique to find out the identity of the deceased victim, and sent the decomposed body or dismembered body parts for identification of the unidentified. In one of the cases of January 2020, a son had killed his mother and thereafter, chopped and disposed of her body parts. It was the technique of facial reconstruction which came to the rescue of police in confirmation of the victim’s identity. The forensic department of King Edward Memorial (KEM) Hospital assisted the Ghatkopar police in this matter, confirming the identification of a 45-year-old lady whose body parts were discovered in two different parts of the city. Generally, the entire procedure of facial reconstruction takes atleast a week to complete; but in this case, the forensic department of KEM hospital, managed to efficiently finish the process in two days.<sup>68</sup> In another case of July 2023, even after days of the incident and repeated efforts, the Worli police failed to determine the identity of the decomposed body found at the Worli Sea Face. They then resorted to facial reconstruction technique, and sent the unidentified body to the

<sup>64</sup> Dr. Sunil Kumar Tripathi, a 72-year-old retired professor in the Department of Forensic Medicine at Institute of Medical Sciences, BHU, had deposed before special Judge J.C. Jagdale, in the matter, claiming the photographs of Bora provided to him were 100% match with the skull.

<sup>65</sup> Facial landmarks, also known as facial key points or facial feature points, are mostly found around the eyes, mouth, nose, and chin. Commonly utilised landmarks are the eye corners, nose tip, nostril corners, mouth corners, terminal points of eyebrow arcs, ear lobes, chin, and so on. Landmarks such as the corners of the eyes or the tip of the nose are known to be less impacted by facial expressions, making them more dependable, and are referred to as fiducial points or fiducial landmarks in the face processing literature. See Congyi Wang, “The Development and Challenges of Face Alignment Algorithms” 1335 *Journal of Physics: Conference Series* 1 (2019); Hamid Ouanan, Mohammed Ouanan, *et.al.*, “Facial landmark localization: Past, present and future” in *2016 4th IEEE International Colloquium on Information Science and Technology (CiSt)* 487 (IEEE, Tangier, Morocco, 2016).

<sup>66</sup> Forensic Odontology is the branch of dentistry that applies dental knowledge to legal issues. Dental evidence can be used to establish human identity by comparing a deceased person’s dental characteristics to ante-mortem dental information. See Alexander Stewart Forrest, “Forensic Odontology” in Max M. Houck (ed.), *II Encyclopedia of Forensic Sciences* 630-645 (Elsevier, 3<sup>rd</sup> edn., 2023).

<sup>67</sup> Swati Deshpande, “Skull given by CBI is a match with Sheena Bora’s face, says expert in court” *The Times of India*, Jan. 03, 2020.

<sup>68</sup> Rupsa Chakraborty, “Son kills woman, dumps body parts: Facial reconstruction at KEM helps police confirm victim’s identity” *Hindustan Times*, Jan. 10, 2020.

forensic department of KEM hospital.<sup>69</sup> It is believed that even though the procedure may not lead to 100 percent accurate results but it definitely provides with a fairly proximate representation of the victim, which certainly is, what is required for the purpose of identification<sup>70</sup>.

#### V. Judicial Response to Applicability of Forensic Facial Reconstruction

In the current era of continuous technological advancement and digitalization, collected photographs and recordings of criminal incidents have propelled facial recognition into the forefront of the judicial system.<sup>71</sup>

In *Henry Westmuller Roberts v. State of Assam*<sup>72</sup>, a young boy was kidnapped for ransom, and later, murdered. The skeleton bones were brought to the FSL for analysis, and the police got numerous photographs of the victim with negatives from the deceased's family, which were also provided to the laboratory. The Scientific Officer (SO) of the Photography Section of that FSL determined that the skull and the image belonged to the same person after completing a superimposition test with an enlarged photograph.

The Supreme Court ruled in *Ram Lochan Ahir v. State of West Bengal*<sup>73</sup> that, the superimposition test of the skull of the deceased was trustworthy. The appellant, who was the accused in the case, had murdered the deceased and buried his body. Based on the statements made by the accused person, a human skeleton, a knife, and a rubber sole were seized during the police investigation. Section 27 of the Indian Evidence Act, 1872 makes such statements admissible. The retrieved materials, such as garments, rubber soles, and other objects, matched those of the deceased. Furthermore, using scientific tools, the photograph of the deceased was superimposed on the discovered skeletons. The photos matched to the deceased<sup>74 75</sup>.

In *Pattu Rajan v. State of Tamil Nadu*<sup>76</sup>, the Supreme Court pointed out that it is the settled practice of our courts in India, that they usually do not rely upon opinion evidence as the sole

<sup>69</sup> Vinay Dalvi, "Cops to order facial reconstruction to ascertain identity of murder victim" *Hindustan Times*, July 18, 2023.

<sup>70</sup> *Ibid.*

<sup>71</sup> Payal V. Bhat, Piyush K. Rao, *et.al.*, "Facial Recognition and Reconstruction" in Deepak Rawtani and Chaudhery Mustansar Hussain (eds.), *Modern Forensic Tools and Devices: Trends in Criminal Investigation* 85-106 (Scrivener Publishing, Beverly, USA, 2023).

<sup>72</sup> (1985) 3 SCC 291.

<sup>73</sup> AIR 1963 SC 1074.

<sup>74</sup> *Ibid.*

<sup>75</sup> See K. Sita Manikyam and J. Lakshmi Charan, "Forensic Facial Reconstruction in Rape-Cum-Murder Cases in India: An Emerging Arena of Forensic Identification" 10(1) *International Journal of Research and Analytical Reviews* 935-936 (Feb. 2023).

<sup>76</sup> *Supra* note 5.

incriminating circumstance, given its fallibility. The same also holds true for the superimposition technique, which cannot be regarded as infallible<sup>77</sup>.

In the matter of *Inspector of Police, Tamil Nadu v. John David*<sup>78</sup>, three distinct branches of forensic science were brought in play for identification of the dead body, viz., DNA fingerprinting, forensic odontology, and superimposition technique. Various parts of the body of the deceased, like skull, torso and certain other limbs were recovered from different places, and the three techniques were applied to get the result. These techniques successfully helped to establish the identity of the deceased victim.

In *Swamy Shraddananda v. State of Karnataka*<sup>79</sup>, expert conducted the photo superimposition method test on the skull, along with the admitted photograph of the deceased. According to the said expert, anthropometric characters or landmarks of the skull and the superimposed admitted photographs matched<sup>80</sup>. In *Mahesh Dhanaji Shinde v. State of Maharashtra*<sup>81</sup>, the investigating authorities, *inter alia*, relied on superimposition test for the purpose of identification of extremely decomposed dead bodies of victims. This shows there is no dearth of cases where the facial reconstruction technique has been relied upon by the courts for identification purposes.

## VI. Conclusion

Mankind is continuously treading on the path of development, be it technological, economical, etc., and always finding ways to sustain such development. Similarly, modernized ways of commission of crimes must be met with equally modernized methods of crime solving. Forensic science is a field which is continuously developing and simultaneously providing support to any legal system in crime investigations. In our country, slowly and gradually transition has happened from application of traditional investigation techniques to appreciation of scientific techniques as supported by forensic science. Still, there is a long distance which has to be traversed, because we are yet to have specific legal provisions which support and make forensic-science based investigations mandatory. In order to bring the techniques used in crime investigations in India at par with global standards, we need to understand and appreciate the importance of forensic science and forensic expert testimony, in our criminal justice system. Efforts are being made by the current government on these lines. The recently introduced *Bharatiya Nagarik Suraksha Sanhita Bill, 2023*,

<sup>77</sup> *Id.* at 791.

<sup>78</sup> *Supra* note 36.

<sup>79</sup> (2007) 12 SCC 288.

<sup>80</sup> *Id.* at 306. Also See, *Shankar alias Gauri Shankar v. State of Tamil Nadu* (1994) 4 SCC 478.

<sup>81</sup> (2014) 4 SCC 292.

incorporates a provision which makes it mandatory to hold forensic investigations in case of crimes punishable with imprisonment of more than seven years, i.e., heinous crimes.

Forensic facial reconstruction technique, which has emerged from physical anthropology, is a forensic-science based technique which has not been utilized much in India. Although, it has certainly achieved breakthroughs in various hard criminal cases, like, Nithari killings, Sheena Bora murder case, Neeraj Grover case, to name a few. Perhaps, like many other forensic science techniques or procedures, the evidence obtained through forensic facial reconstruction is also used as corroborative evidence, and not substantive evidence. It has even been said that when everything else fails, then this technique should be put to use, or, facial reconstruction or superimposition (which is a type of facial reconstruction only) must be supported by radiographic, dental, or DNA evidence to be considered a positive identification. The main usage of the forensic facial reconstruction technique is found in the cases of identification of decomposed or disfigured dead bodies. It is highly sought after in incidents of mass deaths site, but is also of assistance in identifying the 'unidentified remains' found at any scene of crime, even ponds, rivers, wells, trains, hotels, houses, buses, etc.

Facial reconstruction is classified into two categories, *viz.*, 2D and 3D techniques. Both these techniques are sub-classified into manual and computer-generated. In modern times, computers have made the entire superimposition process much faster; precision of the technique has also increased several times. One of the primary advantages of this technique is that facial reconstruction is a quick, non-invasive, and efficient procedure that can be done at any time it is required to be done. In India, forensic reconstruction is still at a very nascent stage. For betterment of results of facial reconstruction, India needs to create state-of-the-art infrastructural facilities, as well as competent and experienced forensic professionals in the area of facial reconstruction.