

# Facial Approximation

## Table of Contents

<b>1</b>	<b>INTRODUCTION</b> .....	<b>2</b>
<b>2</b>	<b>SCOPE</b> .....	<b>2</b>
<b>3</b>	<b>EQUIPMENT</b> .....	<b>2</b>
<b>4</b>	<b>PROCEDURE</b> .....	<b>2</b>
4.1	Anthropological Examination .....	2
4.1.1	Biological Profile Estimation .....	2
4.1.2	Assessment of Features for Facial Approximation .....	2
4.2	Skull Imagery .....	3
4.2.1	Creation of STL Files from CT Scans .....	3
4.3	Consultation between Anthropologist and VIS .....	4
<b>5</b>	<b>LIMITATIONS</b> .....	<b>4</b>
<b>6</b>	<b>SAFETY</b> .....	<b>4</b>
<b>7</b>	<b>REFERENCES</b> .....	<b>4</b>
<b>8</b>	<b>REVISION HISTORY</b> .....	<b>5</b>

# Facial Approximation

## 1 INTRODUCTION

This document describes the procedures for providing anthropological data and imagery to Visual Information Specialists (VIS) in the Operational Projects Unit (OPU) for the production of facial approximations.

## 2 SCOPE

This document applies to Anthropology Examiners and Physical Scientists in the Trace Evidence Unit (TEU) involved in facial approximation and related procedures.

## 3 EQUIPMENT

- 3-dimensional radiography unit (NorthStar X-5000 X-radiography unit or equivalent)
- Software for STL production (3-Matic or equivalent)
- Personal protective equipment (e.g., lab coat, gloves, eye protection)

## 4 PROCEDURE

- A. Facial approximations are performed as a joint procedure between TEU personnel (Anthropology Examiners and Physical Scientists) and VIS.
- B. The following procedures pertain only to the responsibilities of TEU personnel.

### 4.1 Anthropological Examination

- A. Facial approximations will only be performed after an anthropological examination has been conducted.
- B. The anthropological examination may take place within the TEU, or prior to submission (in which case the evidence must be accompanied by an anthropological report).
- C. The anthropological examination will include, at a minimum, biological profile estimation (or portion/s thereof, as applicable) and an assessment of features and/or other information that should be considered for the facial approximation.

#### 4.1.1 Biological Profile Estimation

- A. If the biological profile estimation is performed in the TEU, ANTHRO-300: Forensic Anthropological Examinations and ANTHRO-304: Biological Profile Estimation will be followed.
- B. If the biological profile estimation has been performed previously by an outside anthropologist/agency, this information will be included in the anthropological report.

#### 4.1.2 Assessment of Features for Facial Approximation

- A. The skeletal remains and associated documentation will be assessed for features and/or other information that should be considered for the facial approximation.

- B. This information includes prominent facial features, antemortem alterations that may affect facial structures, dental information (such as antemortem and postmortem tooth loss), and non-anthropological information from the case documentation (e.g., hair color/length, associated artifacts such as eyeglasses, dentures).

## 4.2 Skull Imagery

- A. Imagery of the skull (or relevant portions thereof) will be obtained in TEU and transferred to OPU. Alternatively, imaging data (e.g., surface scanning) may be collected by OPU personnel while the evidence is in the custody of TEU personnel.
- B. This imagery may vary depending on the intended final product (i.e., 2-dimensional or 3-dimensional facial approximation) and may include photographs, surface scan files, or stereolithography (STL) files created from computed tomography (CT) scans.
- C. Data may be transferred via Forensic Advantage, email, or removable hardware (e.g., CD). This transfer will be documented in the Case Communication Log.

### 4.2.1 Creation of STL Files from CT Scans

- A. Open the eFX Reconstruction file (if a previous reconstruction has been performed) or follow the procedures to produce a reconstruction using the Northstar software. On the “Final Setting” screen, set the output volume parameters to 500 microns in the fourth box from the left and then click on “cubical.” Click on the “reconstruct” button to perform the reconstruction.
- B. Once the reconstruction is completed, create a surface using the “Surface” button on the left-hand toolbar at the default ISO level suggested by the software. If too much background is captured or bone is lost, adjust ISO level as necessary using the ISO input in the surface window.
- C. Save the surface as an STL file using the “Save” button on the surface window with the lab number (and item number if applicable) as the file name.
- D. Open 3-matic and import the STL file using the “import part” function under the File menu.
- E. To eliminate extraneous shells from the STL, use the “mark shell” function to select the main skull shell. Then right click on the “marked triangles” in the upper right window (object tree) and select “separate into new part”. Then right click on the original part in the object tree and select “Hide.” Re-click on the new part in the object tree to activate the shell.
- F. To smooth the STL and minimize the size of the file, select the “wrap” function from the Fix menu and select “apply” using the default parameters in the operations window in the lower right. When complete, right click on the unwrapped item in the object tree and select “Hide.” Then click on the wrapped item to activate the wrapped shell.
- G. To prepare the STL file for printing, run the “fix wizard” function from the Fix menu. Make sure all items are checked for review and click “Follow advice.” Continue clicking “Follow advice” until all items are marked “0” except for “shells,” which should be 1, and overlapping triangles, for which it is acceptable to have multiple.

- H. Save the STL using the “Export” function in the File menu. Choose the output directory in the operations window (lower right) and save by clicking “apply.”
- I. Save the entire 3-matic file under the file menu.

#### 4.3 Consultation between Anthropologist and VIS

- A. Following the completion of the facial approximation and prior to its release to the contributor, the anthropology examiner and VIS will review the facial approximation together to confirm consistency with skeletal features.
- B. As appropriate, the facial approximation may be revised until approved by the forensic anthropologists and VIS.
- C. This review will be documented in the Case Communication Log.

#### 5 LIMITATIONS

The conclusions that can be reached from anthropological examinations are dependent on the condition and completeness of the remains, and the availability and quality of antemortem data.

The production of facial approximations is for investigative purposes and is not a means of identification. Describe limitations of the technical procedure.

#### 6 SAFETY

- While working with physical evidence, laboratory personnel will wear at least the minimum appropriate protective attire (e.g., laboratory coat, safety glasses, protective gloves).
- Universal precautions will be followed.
- Exposure to biological and radiological hazards may be associated with the examination techniques performed. Safety procedures related to specific instruments or equipment will be followed. Refer to the [FBI Laboratory Safety Manual](#) for guidance.

#### 7 REFERENCES

ANSI/ASB Best Practice Recommendation 089. Best Practice Recommendation for Facial Approximation in Forensic Anthropology (current version)

FBI Laboratory Safety Manual (current version)

ANTHRO-300: Forensic Anthropological Examinations (current version)

ANTHRO-304: Biological Profile Estimation (current version)

## 8 REVISION HISTORY

Revision	Issued	Changes
03	08/16/2021	Updates to entire document to reflect LD reorganization in which forensic artists performing facial approximations are no longer in the TEU. All portions relating to responsibilities of VIS deleted, and greater specificity added regarding anthropological examinations and production of skull imagery. Replaced SWGANTH document with OSAC Best Practice in References. OPU Facial Approximation procedure added to References.
04	01/28/2022	Formatting and language changes to conform to new template.
05	03/15/2024	Added option for optional skull imagery under 4.2A