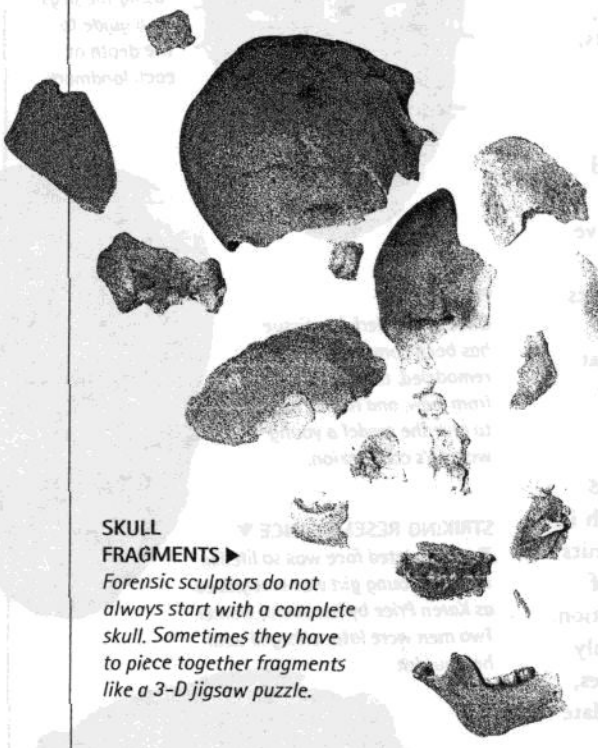
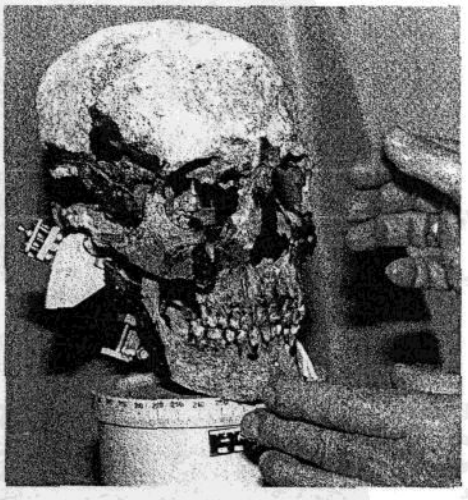
Facial reconstruction in clay

To create a recognizable likeness from nothing but the bare skull of an unknown crime victim demands a rare combination of skills. To keep their creations accurate, sculptors need the objectivity of the forensic anthropologist. But to create a resemblance of a living person also requires the imaginative flair of an artist.



SKULL FRAGMENTS ▶
Forensic sculptors do not always start with a complete skull. Sometimes they have to piece together fragments like a 3-D jigsaw puzzle.



MAKING HEADWAY ▲
If enough skull fragments remain, they can be built into a reasonably complete skull. This skull can then be cast and used as a basis for facial reconstruction.

When skin and muscles decay from a human head, all semblance of character disappears with them. Few of us can look beyond the hollow eye sockets and rictus grin and make the imaginative leap that is necessary to picture a living face. Yet it is the skull that gives the face form and structure, and using its contours as a starting point, forensic sculptors use clay to build up a likeness that can be uncannily realistic.

Pegs and strips

The most common reconstruction method relies on knowledge of the depth of the tissue that overlays every part of a skull. This technique has been dubbed morphometric, from the Greek words for "form" and "measure." It was pioneered in the United States, so it is also known as the American method. Researchers began measuring flesh depth at the end of the 19th century, though the data they compiled was not used for the purposes of forensic reconstruction until around the 1930s.

Initially, the measurements were taken during the dissection of corpses, but recently ultrasound scanning techniques have allowed the measurement of soft tissue depths from living subjects.

Sculptors generally work from between 20 and 35 anatomical landmarks—key tissue depths. Their locations are scattered around the face, but are most densely concentrated around the mouth and between the eyes. Measurements are available for different sexes, ages, and ethnic groups, and for faces that range from emaciated to obese.

Reconstruction starts with depth indicators—typically small pegs. Fixed to the skull (or to a cast of it) at each landmark, these indicate the average flesh depth. Sculptors then apply strips of clay between the pegs. The strips are graded in thickness to match the height of the pegs. Once these strips are in place, clay fills the gaps between them, and the sculptor starts on the eyes, nose, mouth, ears, chin, and jowls.

These are the aspects of the face that give an individual character, but unfortunately they are the features that disappear rapidly as a body decomposes. Though sculptors need experience and judgment to reconstruct them, they also rely on rules of thumb.

Mikhail Gerasimov 1907–1970

Systematic forensic facial reconstruct began with the work of Russian anthropologist Mikhail Gerasimov. Working at Moscow's Third Medical University College, he measured the ti depth on the faces of cadavers awaiti dissection there. When he had enough information, he made his first attemp reconstruction. As a scientific technic assistant at Irkutsk Museum in the lat 1920s, he recreated faces from the fo skulls of early humans. His reconstruc first helped to solve a murder case in 1939, when human bones were found near Leningrad, Russia. However, the work for which he became famous wa the facial reconstruction not of a crim victim, but of Tamerlane, the Mongol

Ahead by a nose

The width of the nose, for example, is roughly the same as the distance between the inner corners of the eyes. The corners of the mouth lie directly below the inner borders of the iris, and lie over the back edge of the canine teeth. Also, ears roughly equal the nose in length—though older people have proportionately longer ears.

Once these features are complete, the sculptor adds finishing touches, and smooths the clay to make it resemble skin, before making a mold from the head in plaster of Paris and silicone rubber. A cast made from this can be painted to resemble a living face, to aid identification.

Building muscle

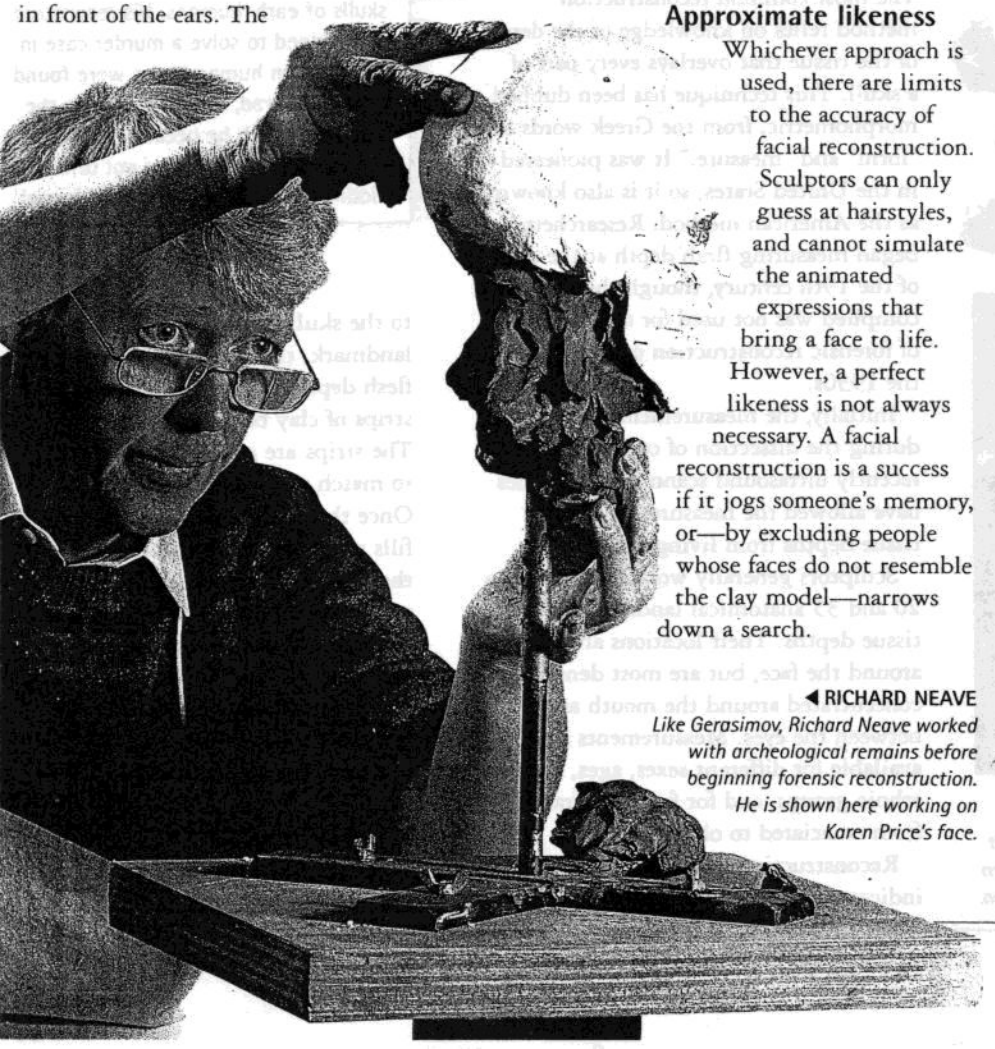
Not all sculptors work this way. Some use the Russian method, also known as morphoscopic, from the Greek words meaning "form" and "looking at." This approach is guided not by tissue depth measurements, but by the form of the skull itself. For example, the cheek's chewing muscles are fixed to horizontal arches of bone at the sides of the head just in front of the ears. The shape and size of these bones directly affect the shape of the attached muscles.

Using features like these, sculptors build up the face muscle by muscle, shaping each one from clay before fixing it into place on the skull. The final step is then to cover the clay "muscles" with a skin of clay. In other respects, reconstruction is similar to the morphometric technique.

Both approaches have merits. Advocates of the first system, based on average measurement of flesh depth, argue that it is more objective and scientific. But morphoscopic sculptors claim average measurements are a poor starting point because a face's character relies on features that are different from the average, such as a big nose or protruding ears.

Approximate likeness

Whichever approach is used, there are limits to the accuracy of facial reconstruction. Sculptors can only guess at hairstyles, and cannot simulate the animated expressions that bring a face to life. However, a perfect likeness is not always necessary. A facial reconstruction is a success if it jogs someone's memory, or—by excluding people whose faces do not resemble the clay model—narrows down a search.



◀ **RICHARD NEAVE**
Like Gerasimov, Richard Neave worked with archeological remains before beginning forensic reconstruction. He is shown here working on Karen Price's face.

◀ **DEPTH PEGS**
To identify a young girl whose skeleton was unearthed in Wales in 1989, medical illustrator Richard Neave begins reconstruction by fixing wooden pegs to a cast.

◀ **JAW MUSCLES**
He next fleshes out the temples and neck with clay "muscles," using the pegs as a guide to the depth at each landmark.

FULL FACE ▶
Once the underlying tissue has been completely remodeled, the pegs disappear from view, and it only remains to give the model a young woman's complexion.

STRIKING RESEMBLANCE ▼
The completed face was so lifelike that the young girl was recognized as Karen Price by her social worker. Two men were later charged with her murder.