

# WAX TO BRONZE

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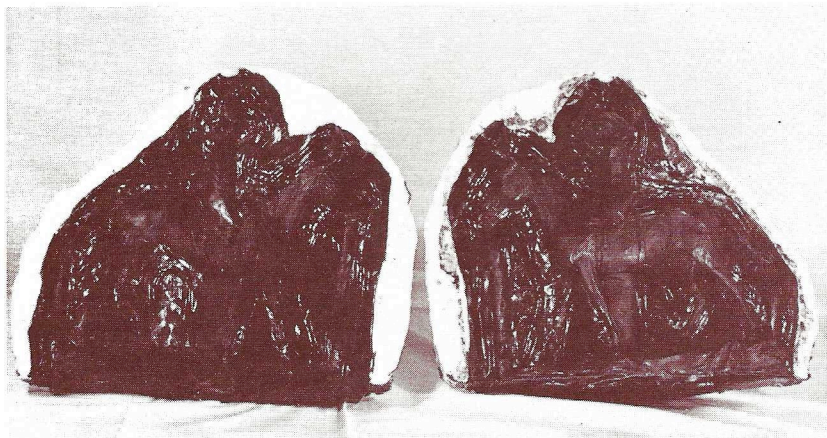


*"Line Rider" by Truman Bolinger. The artist's proof is sculptured in wax.*

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## LOST WAX CASTING

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*Open mold showing newly poured hollow wax statue.*

Professional artists like Truman Bolinger, who envision their finished work in bronze, sculpt the original piece in wax. The basic process of forming molten bronze into an exact reproduction of the wax original is known as the lost wax casting method.

In this procedure the wax is first coated with a hardening material which is then heated to a high temperature. The wax melts and runs out through an opening in the investment leaving a hollow cavity, hence the name, "Lost Wax". The molten bronze is poured into the cavity and replaces the wax form.

The foundries where Bolinger has his casting done use a method that is a recent innovation in the long history of bronze casting. This innovation is known as ceramic shell building, and it insures the finest reproduction of detail and surface quality which was mostly unattainable by earlier processes.

The lost wax method was developed more than four thousand years ago by civilizations in the middle east and Africa. Syrians and Palestinians initially cast crude metals such as lead and later bronze in order to make better weapons. Africans independently developed the process and cast bronze masks in the likeness of their chieftains which were used in ceremonial dances.

In this era, bees wax was used to form the original, and wet clay was packed around it for an investment.

Bronze, because of its fine lustre and malleableness eventually became the first important metal to be cast for the sole purpose of producing an art object.

The casting process begins with the mold. Mold making is an intricate process which allows for duplication of the original art work in wax.

The wax statue is embedded in a sea of smooth clay, dividing the art work in half. Layers of rubber are painted onto this half of the mold, and cloth is placed in between the layers for strength. The rubber is trimmed, and plaster is poured on top of the rubber to form a stiff support.

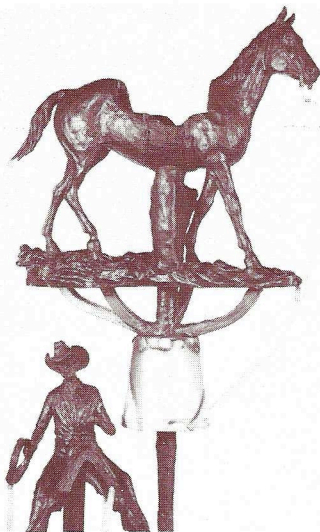
At this point the mold is turned over and the clay is removed. The second half of the wax statue is now revealed. A release agent is applied to the rubber and the entire process is repeated with layers of rubber and a plaster support.

The mold is now complete. It is opened and the original statue is removed. The mold is cleaned and a release agent is painted on the inner surface. The two halves of the shell are clamped together and hot wax is poured into the mold.

The mold is filled with hot wax then emptied, leaving a thin film of wax to coat the mold. This process is repeated several times with very hot then cooler wax. This builds up a shell duplicating the original statue. Thus, the open mold holds the hollow wax statue pictured.



*The artist inspects every model to insure fidelity to the original.*



*Depending on the size and intricacy of the sculpture, the wax is often cut into sections which are cast separately.*

As soon as the wax duplicate is removed from the mold the artist is notified so that he may personally correct any flaws. This is often a time consuming task especially when there is great detail of expression and authenticity. Thus the artist is not only the final judge of the finished bronze but is also involved in the intermediary phases of the foundry art.

In order to make a hollow light-weight bronze, an opening must be cut into the hollow wax, this allows the investing material to fill the cavity. Thus, the rider from Bolinger's "Line Rider" is separated from the horse.

Both pieces of sculpture are mounted onto a structure of wax bars or gates. These gates will serve as passages through which the molten metal will flow to every part of the sculpture. Later, the rider and horse will be welded together again and the weld ground and filed down.

Apart from the introduction of welding technology, the only



*Through a dipping process thin layers of ceramic material adhere to the surface of the sculpture, ensuring fine detail in the casting. Repeated emersions give strength to the shell yet it remains permeable, so that air can escape when molten bronze is poured into the mold.*

other major contribution to the art of bronze casting, made in the last two thousand years, is the ceramic shell investing process. Developed in 1955 by Monsanto of England. The ceramic shell investment was quickly adopted by industrial foundries as a method which gave unusually fine surface detail to metal castings.

Art foundries also began experimenting with this technique, but it was not until the late sixties that ceramic shell building became reliable enough for casting complicated works of art. Quest Art Foundry of Boulder, Colorado, where these pictures were taken, is one of the art foundries in this country that has perfected this technique.

When the ceramic shell is completed, it is set in a hot kiln and the wax melts out. The semi-fragile shell is heated to about 1500°F while the bronze is reduced to a molten state at 2100°F. Wearing asbestos suits to protect themselves from the intense heat, the foundry men remove the shell from the kiln and the



*A brilliant orange in the molten state the 2100°F bronze is poured into the mold through a system of gates.*

molten bronze from the furnace. Still in the molten state the bronze must cool to a certain temperature before it can be poured into the ceramic mold.

Undisturbed until the next day, the shell is carefully broken and removed from the bronze. The gates are cut off the casting and the parts of the sculpture are welded together. The bronze is worked to a finished state in a process often taking days of work by a skilled craftsman, making it an exact replica of the original wax sculpture.

The final step in the foundry process is the application of a patina or coloration to the bronze. Chemicals are brushed onto the bronze, reacting with the metal and with the air to produce a characteristic color. When liver of sulphur is applied to the bare metal, bronze acquires a brown-black color. The addition of other chemicals produces highlights of a different color. For instance, the application of ferric nitrate can give a gold or reddish brown highlight. Literally hundreds of different patinas are possible so the artist must work closely with the craftsmen so the sculpture may achieve its final realization.



*Taking many hours to cool, the bronze sculpture is finally broken out of the mold.*



*Chemicals are brushed onto the bronze, producing a reaction that gives a color or patina to the finished work.*