A Sculptor's Guide To
Tools and Materials

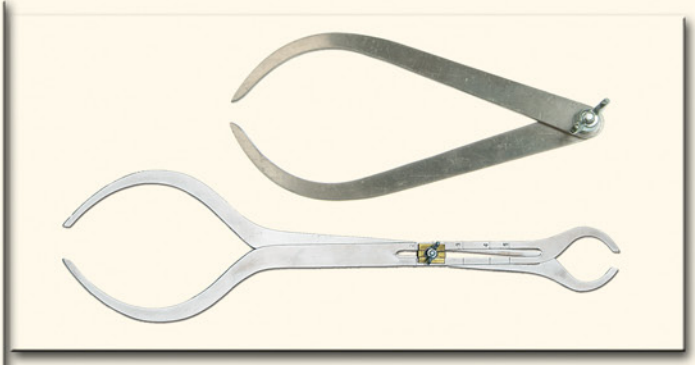
Second Edition

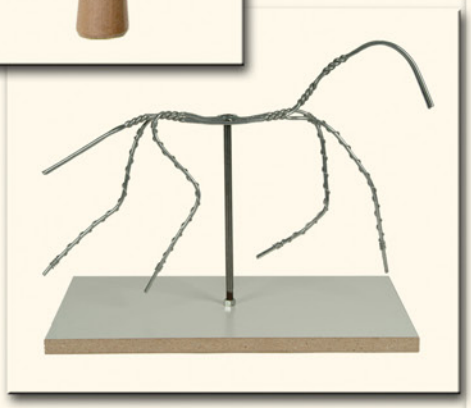
Now With More Than 90 Images!

by Bruner F. Barrie

A SCULPTOR'S GUIDE TO TOOLS AND MATERIALS

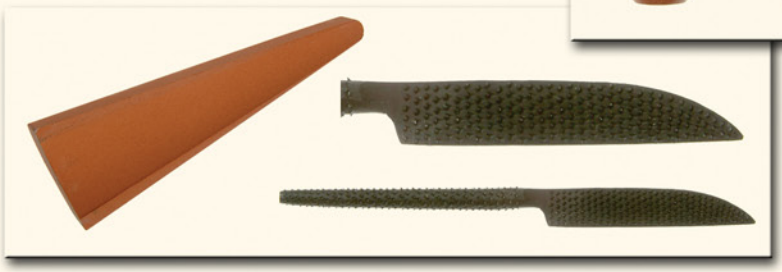
by Bruner F. Barrie






SCULPTURE HOUSE


SCULPTURE HOUSE
CALDWELL, NJ



A Sculptor's Guide To

Tools and Materials

Second Edition

by Bruner F. Barrie

A Sculptor's Guide To **Tools and Materials** - *Second Edition*

First Printing, November 2006

Library of Congress Control Number 2006936739
ISBN 0-9631867-2-8

Layout & Design and Copy Editing by HyBar Consulting Group, Florida
Photographs by: Granite Digital Imaging, LLC., Wellington, Florida
Mega Color Corporation, Deerfield Beach, Florida
Sculpture House, Inc., New York and New Jersey
David Klass, Kent Ullberg and Beatrice Landolt

Sculpture Credits - Inside Back Cover
Pommel Horse Athlete by Joe Menna
Bernini's Ecorché by David Klass
Wildlife Big Horn by Kent Ullberg
All air-dried sculpture by Sandra K. Little
All pottery pieces by Beatrice Landolt

Printed in the UNITED STATES OF AMERICA
Thomson-Shore, Inc., Dexter, MI

A.B.F.S. Publishing
Palm City, Florida • Princeton, New Jersey

About The Author

Bruner F. Barrie

Bruner F. Barrie was born in Abington, Pennsylvania in September 1947. He is a member of the Board of Directors as well as a patron member of The National Sculpture Society in New York and is a member of the International Sculpture Center in Hamilton, New Jersey. He is also certified as a professional Lifecasting Artist.

Mr. Barrie joined Sculpture House, Inc. shortly after his discharge from the United States Air Force, Strategic Air Command, in 1971. He became and is currently the President and Chief Executive Officer.

He is also the author of ***Mold Making, Casting & Patina for the student sculptor***, a book for those who want to make basic molds and casts. This 116-page publication with over 200 photos and line drawings is ideal for the beginner.

Mr. Barrie resides in Palm City, Florida.

Table of Contents

PART 4 • POTTERY & CERAMICS

Introduction

WHEN I FIRST WROTE THIS BOOK IN 1996, I NOTED THAT all of us have had some experience with art. Most of us even have some knowledge of the art field and the materials used by artists. And I stated that most art students have a good overall understanding of their specific fields of study, whether it be pen and ink, abstract drawing, painting, or sculpture. My observations have not changed over the last ten years.

Sculpture, one of the disciplines within the art field, still constitutes only about three percent of the entire art field. Its major categories, such as ceramics, wood carving, stone carving, mold making and casting, still vary greatly. And students, as well as teachers of sculpture, still may not know all aspects of sculpture; for example, a stone carving instructor may very well know everything there is to know about carving stone, where it originates, and the various hardnesses and colors of stone, but might not know at what temperature to bisque fire a stoneware clay. This is not uncommon; the stone carver should not be expected to know all that a ceramist would know about modeling clay and firing, and vice versa. The same would hold true for wood carvers; they, too, would have limited or no knowledge of mold making and casting bronze.

That is why I wrote the first edition of this book in 1996 and why I have chosen to update it now in 2006. With over thirty-five years of experience in the manufacture and sale of sculpture tools, materials and accessories, and having been given formal instruction in all areas of sculpture (stone carving, wood carving, mold making, casting, wax work, enlarging, and pottery) I have acquired hands-on experience enabling me to answer questions in all sculpting categories. I can also identify the sources for those items that may be somewhat outside the field of sculpture.

While this book was originally intended for the sales staff of Sculpture House (so they could answer your questions and provide

product information to those purchasing our materials) and for the sales staff at art stores who sell sculpture materials and supplies, the last ten years has shown me that there is a wider audience for this reference guide.

This guide incorporates general product information as well as tool weights and dimensions, answers to the most frequently asked questions, and troubleshooting tips.

I still believe the information herein will be of assistance to you. If, after you read this book, you still have any unanswered questions, contact us and my staff will try their hardest to answer them.

Let's continue to keep sculpture alive!

How to Use this Guide

Key Word Technique

When using this guide, first identify the **general topic** you are exploring. Second, define the **medium** in which you want to work, the **function** you want to perform, or the **tool** or **accessory** you want to use. For example: Suppose you want to make a wall tile using clay - wall tile is the topic; and clay is the medium in which you want to work. Next, choose a **key word** used in either the topic, medium, or function. Then refer to the Table of Contents, Glossary, or Index for more information on that key word.

- For information on a **general topic**, refer to the Table of Contents to find where the information will be found in the manual.

- If you are looking for information on a **medium**, **tool, or accessory,** such as plastilina, Microcrystalline wax, or a wood carving tool, refer to the Glossary or Index using these as key words.

- If you have a specific question, such as "How do I make a mold of a clay figure?", determine what you want to do, or the medium in which you want to work, and look up the key word in the Glossary to find the appropriate page(s).

- To determine the size and weight of a specific tool supplied by Sculpture House, Inc., refer to Appendix E: Tool Weights and Dimensions. All tools are listed by item number; functional ends, weight, and overall lengths are given for each.

- If you are looking for the correct amount of material required to sculpt a head/bust, figure, or animal, such as "How much latex would be required to make a head mold?" or "How much plaster should be used to make a mother mold of an 18-inch figure?", refer to Appendix F: Material Requirements Usage Chart.

Part 1

Modeling

CHAPTER 1

Plastilina

PLASTILINA IS A WAX AND OIL-BASE MODELING MATERIAL used by sculptors for modeling pieces. The main ingredients are wax, oil, and clay flour which is used as a binder. All plastilina is produced hot, and then cooled and extruded into the shape that will eventually be available for sale in art supply stores. There are basically three groups of plastilina: **professional grade, school grade,** and **industrial grade**.

The **professional grade** commonly contains sulfur, to make the smoother, more homogeneous texture required by professionals. A non-sulfur professional grade material in medium consistency is also available. The **school grade**, or amateur grade material, does not contain sulfur and tends to be stiffer and harder to model with the fingers. School grade material comes in a variety of striking colors and is used in the claymation field of movie production and advertising. The **industrial grade** material is usually very hard and needs to be heated prior to use. This type of material is most commonly used by designers in the automotive field for car models and is not available to the retail consumer. The large auto companies use batch lots in large quantities of 2,000 pounds or more, and the material is so hard it cannot be modeled at room temperature.

Plastilina can also be referred to as plasteline, plasticium, and plasticine. I imagine there are a few other spellings, but basically all are wax and oil-base modeling materials. Plastilina is used as a modeling material only and **cannot** and should not be fired in any way. Plastilina cannot be made permanent. A mold of plaster or rubber must be made to obtain a finished piece.

Although the material is permanently pliable due to its wax and oil content, it will dry out or become stiff after a number of plaster molds have been made over the material, or after it has been used over natural wood armatures. After a long period of time, the oil may seep out and evaporate, causing dryness. To refurbish the material, small amounts of household oil or 30-weight motor oil may be kneaded into it, a small amount at a time. Placing the plastilina near a 60-watt light

bulb for twenty to thirty minutes will soften it enough to make it easier to work with. For refurbishing 10 to 20 pounds, purchase a hand hamburger grinder at the local hardware store, add the oil as described above and run the mixture through the grinder several times. For extremely large quantities the plastilina can be returned to the manufacturer and refurbished, usually for a nominal charge.

One disadvantage of plastilina is that there is no way to make the material permanent; so be prepared to make a mold and cast or have one made of the piece.[1] A great advantage of this material is that it may be stored and worked over a long period without hardening; changes, additions, or corrections are easily made.

The **professional grade** material is packaged in two-pound units and comes in three colors: grey-green, off-white, and brown or natural tan. It is available in four basic hardnesses. Number One is the softest and is used for building up large pieces of monumental size. Number Two, a medium grade, and the most commonly used by sculptors, is used for heads and busts and figures ranging up to three feet. Number Three is used for more detailed work and is sometimes placed over the Number One and Number Two when working on facial features. Number Four is the hardest and is used for medallions, coins, and extremely detailed small work.

The **professional grade** material normally contains sulfur and cannot be used with most rubber molds without some form of a separator, such as shellac, between the plastilina and the rubber. It is recommended that a separator coating be used in all cases as a precaution. This separator is not necessary, however, with the non-sulfur professional grade material.

The **school grade** material is packaged in one-pound and five-pound units and comes in a variety of colors. The cost of production is less than for the professional grade, and the retail price is therefore lower.

There aren't many manufacturers of plastilina in the professional or school grades. Your local art supply store will be able to give you information on the manufacturers of the different materials they carry. You can then refer any questions you have directly to the specific manufacturer.

Creating a piece of sculpture in Plastilina
Bernini's Ecorché by David Klass

Troubleshooting/Questions

How can I soften plastilina?

To soften plastilina, if not being used at room temperature, 68° - 70°, place the material approximately two to three feet from a 60-watt light bulb for about twenty minutes. To change the grade consistency (for example, to soften grade No. 3 plastilina to grade No. 2 plastilina), soften the clay as instructed above by placing it near a light bulb and knead in

[1] See Chapter 6: Mold Making & Casting

small amounts of oil until an even consistency is achieved.

How can I harden plastilina?

To harden plastilina, place it in the refrigerator for thirty to forty minutes before working with it. There is no technique for permanent hardening. To change the grade consistency (for example, to harden grade No. 2 plastilina to grade No. 3 plastilina), soften the clay as directed above and add softened Microcrystalline Wax in small amounts to the material by kneading it into the softened plastilina until the desired consistency is achieved.

How can I restore dried out plastilina?

Knead household oil, a few drops at a time, into the material until you have acquired the desired consistency.

How can I correct color inconsistencies?

This is not easily done since the raw materials will vary from batch to batch. While manufacturers cannot guarantee the production of totally accurate color batches from materials received from the pigment producer, they work hard to achieve the closest possible color consistency. Purchase in batch lots if possible if accurate color consistency is absolutely necessary. Remember the plastilina is only a model to be cast and is not the finished piece. Most of the time the color will be extremely close, but as with everything made of natural ingredients it may vary.

How can I correct uneven consistencies?

Since the raw materials are of natural origin they will vary. Although manufacturers attempt to guarantee consistency, composition changes over long periods of time cannot be avoided. Consistency will be the goal of the manufacturer but may not always be achieved.

Hardness. This is regulated by the ingredients in the specific formula and, depending on the variation of the raw materials, may differ slightly, although not commonly. During temperature changes in the weather, the material will also change slightly; in the summer, the material seems softer and in winter months, it may seem harder. Sitting at room temperature for eight hours, all plastilina should return to its stated hardness.

Short-Dry Material. This is caused by lack of wax or oil, or may occur because the manufacturer has not aged the plastilina (that is, allowing it to mature for several weeks, if not months, before packaging). Add household oil or return the material to the supplier.

Can I heat the material in my kitchen oven?

Yes, but it is not recommended. The outside will melt before the center. Rather, place the material two to three feet from a 60-watt light bulb for twenty minutes and it will soften through like butter left on the counter; it will return to its stated consistency when left at room temperature.

Can I microwave plastilina?

Some people do, but it is not recommended for plastilina containing sulfur since people tend to overcook the material. If you do attempt to microwave plastilina containing sulfur, be careful - the plastilina is melted to a more liquid state and since the component parts contain sulfur, it might smell. The basic formula for plastilina is wax, oil and clay flour so take this into consideration before doing something that you may regret later!

Non-sulfur plastilina can be placed in a microwave oven to soften it for use, but since microwave ovens have different power levels and wattage varies, there is no one set rule for successfully heating the plastilina - accomplish this by trial and error.

Can plastilina be melted and poured?

No! The physical make-up does not allow this. Some of the material's components could ignite when heating excessively. Remember, this is a wax and oil-base modeling material.

How can I make plastilina permanent?

You can't. A mold must be made and a cast drawn for the final piece.

CHAPTER 2

Direct Modeling Materials

Air-Dried, Non-Firing Materials

A DIRECT MODELING MATERIAL IS ONE THAT CURES NATURALLY producing a finished piece with no other mold making and casting procedures require.

Clays

Air-dried or non-firing clays (also known as self-hardening or air-hardening) do not need to be fired in a kiln, and are generally ceramic clay body formulas with a natural additive, such as cornstarch, to make them harden. They are not meant to replace kiln-fired ceramic clay, cannot be used to produce functional ware, and cannot be left outside exposed to the elements. Pieces made using these clays are items for display only. The material should **not** be fired in a ceramic kiln under any circumstances. It is porous and cannot hold liquid unless sealed on the inside surface.

After a finished piece has dried and been sealed, it can be decorated for display in a number of interesting ways. You can add bright colors using acrylic, oil, latex, or watercolor paint, or you can achieve mute color effects using wood stain, wax pigmentation applications, or clothes dyes. You can also spray the finished piece with special effect paints obtained from hardware stores.

There are two basic types of air-hardening clay. The first type, **Claystone**, works like plastilina and is used over an armature, an internal support device. The clay material generally contains some type of pulp or cotton fiber filler to reduce shrinkage and thus prevent cracking. (The armature will not give when the clay shrinks due to evaporation of moisture.) Please note, there will be some degree of shrinkage when using a water-base material, so expect minor cracking if the piece is thin and modeled over a solid support. Cracking may also appear at sharp angles and joints. The material over an armature will most likely be fatty or more bulky due to the filler that is incorporated in the formula to reduce shrinkage.

Boneware, is used for solid direct modeling that in essence will be supported by its own bulk. It will contain a natural hardener, but not fiber, to reduce shrinkage and will probably feel and react more like a ceramics clay to the touch and in workability.

The primary colors of Claystone and Boneware are gray and red. Sometimes referred to as stone gray or even terra cotta, the colors are generally deeper and richer than what is usually expected.

There is another type of self-hardening material that can be air-dried or fired in the kitchen oven to give the piece more durability. An example of this material is **Della Robbia**. This type of material will not replace a kiln-fired ceramic clay that is fired in excess of 2000°F fusing the molecular structure and becoming vitrified and non-porous. Please note, for any self-hardening clay there is no known method to emulate vitrification.

Note that with all the self-hardening clays the inside of the piece will dry last since the outer coating will harden first sealing the external parts. Drying on a rack, such as a bread rack, is the preferred method to achieve even drying. Drying time will vary depending on the bulk of the material. (In some cases it can take up to three months for larger pieces.) Water constitutes about 20% of the volume of a piece. To determine when the piece is completely dry, first weigh the original, then periodically weigh the piece while it is drying - when the weight has decreased by 20%, you will know it is dry.

To maintain the material's pliability when not working with it, keep it airtight and spray it with water using a plant mister. A damp cloth may also be draped over a piece during short work breaks to maintain its plasticity.

Liquid Metal

In the first edition of this book, I discussed Sculp-metal, a pliable air-hardening material that could be modeled with a modeling tool or by hand. As of this writing SculpMetal is no longer available. Atomized Materials Co., Inc. of Cecil, Pennsylvania, manufactures a product called Kwik Metal - a cold solder for metal glazing and metal filling. (A primary use for Kwik Metal is repair work on cars and trucks.) According to the product's packaging, it applies like putty and hardens like metal. It is highly flammable, and harmful if swallowed.

Plaster

Although plaster is considered a direct modeling material by some, it is not widely used as such. The rapid setting time of the plaster (15 to 20 minutes) requires the sculptor to work extremely fast. Therefore a very small percentage of highly qualified professional sculptors are usually the only artists who use this material for direct modeling.

Polymer Clay (Plastic)

This material is more commonly used in the craft field. It is available in various colors but white is usually the color of choice. Like Sculp-metal, it is a somewhat rubbery material compared to a ceramic clay, and does not model as well because of its flow factor. It may be modeled by hand or with modeling tools and can be fired in a conventional kitchen oven. The final piece will be hard plastic which is quite durable with little shrinkage or distortion.

I do not know of any large head and bust figures being done in this medium so I have no personal comment on the material's ability

to produce desired effects in the traditional sculpture field. For small relief figures and medallions, I believe it's the finest material available today. The shelf life of this material, if it remains packaged, is approximately six months before it may harden; if opened, you can work with it for months with no danger of hardening if it's kept airtight when not in use.

Paverpol

Paverpol is an environmentally friendly, water-based textile hardener used to turn fabric into a weather-resistant sculpting medium. It's available in transparent, bronze and gray; the transparent can be mixed with Paverpol or other acrylic paints to add color.

To use, immerse natural fabrics such as cotton, wool or silk, in Paverpol, then drape or wrap the material around an armature or other internal support structure and leave it to dry. Paverpol dries quickly yet slowly enough to give you plenty of time to create your piece. After hardening completely you'll have a permanent sculpture that can be used both indoors and outdoors. It will withstand rain, wind, sun, snow and frost!

Other Clays

There have been a few new and exciting reinforced ceramic throwing clays and unique firing clays developed within the past several years. **Paper Clay** and **Fiber Clay** are ceramic water-base throwing and hand building materials that have paper or pulp fillers (Paper Clay) and/or cotton fiber fillers (Fiber Clay) added to enhance the strength of the clay body when throwing on a wheel or hand building. The additional strength from the pulp and fiber enables pieces to be thrown higher with more stability and allows the greenware to be transported more easily minimizing breakage.

Another unique clay is **Silver Metal Clay** primarily developed in Japan for making jewelry. This material is sterling silver and when modeled wet and then dried can be fired in a ceramic kiln - the finished piece is .999 fine sterling silver. The material is somewhat more expensive than ceramic clays but the results, after practice, are extraordinary!

Waxes

Most waxes are derivatives of oil or petrolatum base materials. The exception is natural beeswax. Waxes will vary in consistency and color. In sculpture two primary waxes are used 90% of the time: Microcrystalline Wax and Roman Casting Wax.

Microcrystalline Wax, also known generically as Victory Brown and micro wax, is by far the most popular wax. It is medium soft, inexpensive, and nut-brown in color. Although it's somewhat sticky, it can be used for direct modeling and the lost wax method of mold making.

Roman Casting Wax, harder, more brittle and varying from purple to black in color, is used to make final detailed definitions prior to casting as well as for carving and modeling small objects. It is also used for casting prior to bronze investment

There are specific formula waxes such as **French Wax,** a mixture of white micro, pure beeswax, and a small amount of number A4 wax (a private studio blend of Sculpture House, Inc.). This material is of medium consistency and is extremely smooth and easy to model. It may also be used for the lost wax process, as any wax can be. This superior material costs somewhat more than micro wax.

Pure Beeswax, a very fine, smooth, natural wax with a unique texture is oftentimes used for advanced modeling and dressing wood sculpture. **Synthetic Beeswax** is a good substitute for the real thing.

Sheet waxes are also available as well as rod, tubing and square waxes. There are paraffin waxes for candle making and special mixture waxes used for jewelry, all available in a multitude of colors. While these waxes may be used in the sculpture field, generally they are not. Rod, tubing and square waxes are usually used for spurring or a type of gating when gases need to be released from a casting so as not to prevent air pocket build-up. These special shaped waxes can be found through most jewelry supply outlets.

Troubleshooting/Questions

What is cracking?

This is a common effect when the material is applied too thinly against a stiff armature or is dried too fast, especially in thin areas or at acute angles. The cracks can be filled with new material and sanded when dry.

What is discoloration?

At times the material will dry with uneven coloration. This is a natural phenomenon and cannot be explained. The cure for this is to apply a thin coat of wood or furniture stain in the desired color prior to sealing the piece for final display.

How can I dry a piece correctly?

The material should be dried extremely slowly for best effect. This is done by placing a damp cloth over the piece and drying it at room temperature slowly and evenly. It is not recommended to place the material in the sun, in an oven, or by a radiator to hasten drying. Remember to allow the piece to dry thoroughly before sealing or applying patina (coloring).

Will hardened material be vitrified (non-porous)?

No. Air-dried materials are characteristically porous and will not hold liquids or withstand the effects of outside weather over a sustained period of time.

Can these materials be thrown on a potter's wheel?

Boneware has been specially re-formulated to be thrown on wheels for small- to medium-sized pieces. However, since Boneware is an air-dried material, it cannot be fired. Most other air-dried materials on the market today will not stand up to the added water required to bring up the side walls on pottery, although there are products that come close.

How can I seal this to hold water?

Generally, this is not doable but applying several coatings of shellac or transparent clear spray enamel on the inner surface of the piece might be a solution. Remember these materials are for decorative purposes only and not meant for use in functional items.

Can the finished piece be colored?

Yes, in a variety of textures, such as clear finish or matte finish, that are directly applied to the piece. For more realistic colors, sealing the surface to be covered with clear or base paint color will allow the final coating color to adhere easily. This may be latex paint, acrylic, oil, or even water colors. I recommend a test tile be made and that you experiment to achieve best results. I number each test tile and write down what steps I have taken to create a given effect on each tile.

How do I stop warping?

With tiles and relief models, it is best to place the piece on a bread drying rack exposing the bottom areas to air; then place a damp cloth on the outer surface so the piece can dry slowly.

CHAPTER 3

Modeling Tools

Modeling Accessories

WHILE THE THUMB AND FINGERS ARE BY FAR THE BEST modeling implements, sometimes additional tools are required. Modeling tools come in a variety of styles, shapes, and sizes. Their primary uses are cutting, scraping, or shaping modeling material in a certain way to create a desired effect. The tools most commonly used by sculptors are wire end tools for cutting and scraping, and those constructed of solid plastic or wood designed for shaping and detail work.

It is important to mention here that modeling tools are interchangeable. For example, tools used for working with plaster and in mold making may also be used in modeling plastilina and wax, sometimes even for cutting soft wood or detailing harder woods or stone. Whatever their application, all tools are acceptable in the sculpture field. It is always best to consult with an instructor or sculpting professional to determine the best size and shape of modeling tool required for a specific project. A head and bust twice life size will not require the same tools as a small medallion or bas-relief; modeling plastilina, as opposed to ceramic clay, wax, or plaster, may require a different set of tools although many are interchangeable.

Tools wear down over time, wearing faster when used extensively on abrasive materials. For example, a ceramic clay tool of brass wire which is very soft and used on smooth clay will last ten times longer than the same tool used to trim pottery made of terra cotta with grog, an abrasive material. With time wood modeling tools will even take the shape of a sculptor's thumb or finger. I have seen this quite often.

Wire End Modeling Tools

The wire end series will vary with the type of wire used for cutting and the material it will be cutting. Ceramic sculptors generally use tools with half-round or semi-sharp cutting edges, or a combination tool with one wire end and one smoothing end. Since ceramic clay is so soft the tool need not have a great deal of cutting ability.

When working with wax and plastilina, however, a tool with a somewhat sharper

cutting edge is necessary since the material is firmer and more detail work may be desired. Certain types of wax, roman casting in particular, will need a sharp edge (This type of tool can also be used with ceramic clay when it is in the leather-hard state.) Working on set plaster will also require a heavy sharp cutting edge.

While there may be slight variations among producers of wire end tools, the major types include: **single wire end, double wire end, and combination of single wire and plain modeling end.** These tools have the following types of cutting ends: **soft round, semi-sharpened, heavy sharpened, half round, serrated (curved) and thin round.** The type of metal used to make the wire ends are: c**arbon steel for heavier tools, tool steel, piano wire, spring steel, and brass half round.**

A. Single Wire End Tool B. Double Wire End Tool

Wood and Plastic Modeling Tools

Flat or hand modeling tools, sometimes known as thumb tools since the thumb is almost always used to hold the tool while modeling, are produced in hard or medium hard woods or in high impact plastic by injection molding. Since all modeling tools are made by hand, they may vary slightly in size and shape.

The wood may also vary. Boxwood and lignum vitae have been almost unattainable because of the Haiti embargo. Maple and Acacia wood have been used as substitutes. Most wood tools will be sealed with wax or varnish but may be customized by sanding or rasping if the shape is not exactly as desired to perform a specific function. A coating of wax and/or shellac will reseal the reshape tool.

A. Plastic Modeling Tools B. Wood Modeling Tools

Tool Handles

Modeling tool handles may be made of wood such as birch, oak, and fir as well as aluminum tubing cut to the desired length. The majority of wire end tools will have the wires and handles attached with solid spun ferrules normally made of brass or nickel, attached using heavy strength waterproof glue. Wooden handles are round tapered wood turnings of which the rounded end, attached where the ferrules, glue, wire, and wood come together, is ground flat to let the wire sit between the wood and metal. Aluminum handled tools are pressure stamped or crimped, with the wire inside the tubing of the handle, and then polished smooth. At times you may see wire end tools, generally from Taiwan or China, with wire wrapping securing the ends to the

handle.

With absorption and evaporation of moisture, ferrules and wires may work loose or crack due to the expansion and contraction of the wood. There is no way to stop this since it is a natural occurrence; however, epoxy or electrical tape can be applied if the cracking or loosening becomes extreme.

Modeling Tool Kits

There are several tool kits available with a variety of tools included. These kits are designed for the beginner or intermediate artist since it might be easier to purchase a set than try to decide what may be needed. Most kits are designed to include the most commonly used tools for a given medium, for example, a steel tool set to be used with wax, plaster, and plastilina or a plastic and wood modeling tool set for school children modeling in ceramic water base clay. You should never purchase more tools than are needed for a project. Ask an instructor, art store retailer, or even the manufacturer who produces the tool sets for advice.

Plaster Tools

Plaster carving chisels have sharpened ends and are meant for carving plaster, but may also be used on wood, plastilina, and even soft stone.

Plaster Carving Chisel

Plaster scrapers have thick wooden handles to facilitate the cutting or scraping function without undue stress while holding the tool. They have hooked ends which are mostly serrated and made of heavy and lighter weight steel ground sharp. They come in four sizes with the largest in size being the heaviest in weight.

Plaster Scraper

Wax Tools

These tools are made of 1095C high carbon steel and can be used with other media just as most of these tools in sculpture can. The difference is that these tools were especially designed and produced for the wax modeling process. The shapes and radial curves of some of the tools make them ideal for heat absorption and concave modeling. Wax tools when heated with an alcohol lamp are used to smooth and sculpt the wax after the basic geometric design has been established. They come in various sizes differing in length and thickness.

Wax Tools

Steel Tools

Also known as steel plaster and modeling tools, these tools are made of high carbon steel, and can be used in sculpting, mold making, and casting, with wax, plaster, plastilina, or moist clay. They are solid steel, shaped and ground from a single piece of stock. The circumference of the handle or holding shaft varies with each tool size and has a delicate feel when work-

ing.

The tools come in a variety of sizes, shapes, and designs. The palette shaped tools have flexible ends and are generally used in smoothing, mold making, and for mold repairs. Those with heavier stiff or firm ends are used for carving, scraping, and finishing. Usually each end performs a separate function: serrated edges give texture and substance and remove material; curved or hook ends are used for pulling or scraping; cutting or modeling ends for scraping and carving, and rounded, flat ends for smoothing.

Minarettes are fine steel tools used for retouching and small detail work.

Stainless Steel Tools

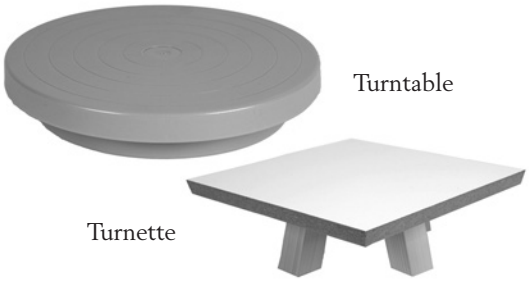
An exciting development in the manufacture of metal modeling tools is the use of stainless steel in their production. For years, the original tools have been made with 1095 or machine carbon steel. This material is very good where spring and a fine cutting edge is concerned; its drawback is that these tools could rust and/or pit over time. While for the amateur this would be of little concern, for the professional sculptor it would be a factor. The new style stainless steel tools have pretty much the same spring and cutting attributes, but without the possibility of rusting and/or corrosion over time. I think we will see more and more acceptance and use of these tools.

A. Steel Tools B. Stainless Steel Tools

Modeling Accessories

There are several accessories which can be helpful during a project. One such item is the **banding wheel**, a small plastic turntable that a model can be placed on and that can be rotated like a lazy Susan.

Turnettes are wooden tables that can support a model of several pounds while rotating easily. Some are square and some are round; one even has holes in it to accommodate aluminum wire, another has a 45° slot for a backboard on which you can do relief work. These tables are normally used to hold small models rather than large full figures.[1]



Calipers, though considered by some to be tools, are actually accessories. They are C-shaped expandable devices used to measure distance between points so an exact likeness can be attained. They can be used, either concave or convex, and come in sizes from 6 inches to 12 inches and expanding out up to 18 inches. They are mostly made of press cut aluminum of a heavy gauge secured with lock washers.

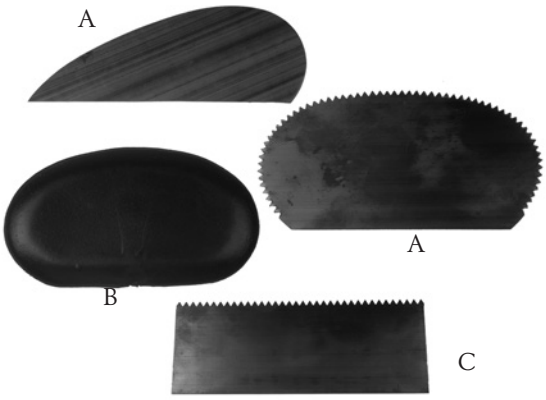
Calipers

[1] Rotary wheels or fifth wheels are used for larger items of greater weight. See page 51 for details.

There are also wooden calipers of the same size, but if they become wet they can warp, making them unusable. There are also proportional calipers used in the enlargement and reduction of pieces. These are available in sizes from 18 inches to 42 inches and are normally used by professional or advanced sculptors.

Flexible palettes are helpful accessories used for smoothing or scraping, or for pottery trimming and leveling the base of thrown clay. They are available in about six shapes including half round, oval, square, and pointed. They are usually made of blue spring steel or rubber, are about 4 to 5 inches in length, and are extremely flexible.

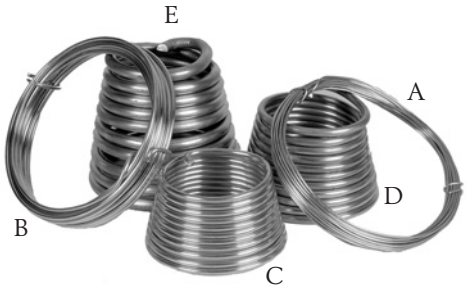
Block scrapers are rectangular accessories and come in heavy steel with or without serrated teeth. They are used for mold leveling or scraping down mold sides or walls. They can also be used to smooth large models and come in 6 inch and 9 inch lengths.



A. Steel Palettes B. Rubber Palette C. Blocked Scraper

Aluminum wire, also known as **Almaloy Wire**, is an essential piece of sculpture equipment primarily used to build armatures. This is a very pliable aluminum wire available in five different diameters: 1/16, 1/8, 3/16, ¼ and 3/8 inch diameters, and three lengths: 32, 20, and 10 foot lengths. The smallest, 1/16 inch diameter, is principally used as wrapping wire allowing clay to more easily adhere to armature sections for build-up. The largest, 3/8 inch diameter, is used to construct specifically designed full size support systems. The other sizes can be used in a number of ways but are usually meant for arms, legs, and appendages of different sorts. Aluminum wire is recommended over other materials for an internal support structure since it will not stain, or rust through a casting in plaster, and it will not corrode. The material is also pliable and light weight.

Almaloy Wire is produced at mills in 80 - 100 pound rolls, each in a specific size. Each run is usually 2 to 3 tons of these 80 - 100 pound rolls in all sizes. The bulk rolls are then cut down, into coils of the most commonly used lengths for sculpture. The rolling and cutting machine chucks are set for these specific lengths and cannot be altered to cut other lengths. Requests for 200 foot continuous wire are sometimes made; they cannot be filled since a chuck large enough to hold that quantity of material does not exist.



Armature Wire

A. 1/16" B. 1/8" C. 3/16" D. ¼" E. 3/8"

An **alcohol lamp** is used for heating the wax tool tips to model hardened wax and detailing wax sculpture prior to mold making and casting.

Alcohol Lamp

Troubleshooting/Questions

How precise will a proportional caliper be?

A proportional caliper will measure up to five times a given increment but it is not a high tech tool or a precise device for exacting minute detail. Use it to give approximate measurements for geometrical proportions.

Does the Almaloy Wire (aluminum wire) come in longer continuous lengths other than coils?

Yes. The manufacturer runs these items in coils by weight not length. Each spool can weigh between 80 and 100 pounds in one continuous length. Unfortunately the spools will vary within each shipment so there is no predetermined weight or length until they are individually rewound into the most commonly desired lengths. While not a common practice, some suppliers will sell a complete spool to individuals, but the price will vary depending on the weight.

How clean do I have to keep my tools?

It is best not to leave tools coated with the working medium, such as moist clay and plaster. Keep them clean and dry when not in use, and they will last a lifetime, although normal wear may reduce them in size.

What about sharpening my tools - can I do this myself?

Most wire end tools are not sharpened unless you are a professional sculptor and have the means to do so. Steel tools, however, can easily be sharpened with a bench stone much like sharpening a carving knife for steak, since the steel is high carbon and tempered. There are different shapes and sizes of sharpening stones available to handle any sharpening necessary. See Chapter 10 for more information.

CHAPTER 4

Armatures

AN ARMATURE IS AN INTERNAL SUPPORT STRUCTURE OR device used to hold the heavy weight of moist clay, plastilina, and other sculpting material that will not support itself. This support structure is usually used when modeling figures and heads over 5 pounds in weight. The armature is much like the human body where the bone structure acts as the armature for the muscle and skin tissue that surrounds it.

Armatures can be made of various materials ranging from newspaper, wax, and two-by-four pieces of wood to screen mesh or chicken wire. For most students of sculpture, the most widely used material to make armatures is aluminum wire. Every armature will have a waterproof base board which holds the guts of the structure. Manufacturers design their armatures somewhat differently from each other, but the basic designs are the same. Some use wood as a base, others use pipe on flanges. Take your choice.

When you have sculpted a piece over an armature, you will have to have a mold made of the piece unless you are using moist clay (also known as ceramic clay) or self-hardening clay. In those cases, remove the piece from the armature when it is leather-hard, cutting and pulling the material from the armature and then reattaching the cut seam.

Types of Armatures

Most commercial armatures are made in three basic types: the **Head** and **Head-Bust; Figure;** and **Animal (horse**). These three are the principal shapes used in the sculpture field. The armature is secured with a backiron of sturdy steel onto a base of Formica on heavy gauge flakeboard or plywood.

Head armatures, which include the head and a portion of the neck, are available in different sizes: 13" (½-life size), 15"(5/8-life size), and 20" (life size). The smaller the size the less support is necessary in the base.

Head-Bust armatures, the more widely used of this type, include the head and a portion of the shoulders (bust). They are fitted with a heavy duty backiron support for the Almaloy Wire and the cross bar that makes up the lower portion of

the bust. It is available only in 24" life size.

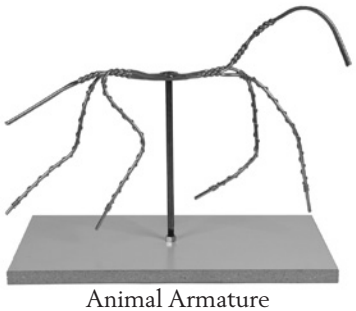
Head Armature

Head-Bust Armature

Figure armatures are the most varied and the most popular armatures. They are available in 8, 12, 15, 18, 24, and 36 inch heights. The 15, 18, and 24 inch models have adjustable back irons so the figure can be moved up and down on its back iron support. The others have fixed supports. Wrapping wire is added where necessary for adhesion of the clay.

Animal armatures have the shape of a horse; since most animals have this basic shape, it is the only animal armature available. These armatures are available in three sizes: 6, 8, and 10 inches. The 8 inch armature has an adjustable back iron, the 6 and 10 inch are fixed. If other forms such as birds or frogs are desired, they can be constructed using Almaloy Wire lengths, shaped as necessary.

Figure Armature



Animal Armature

Building Your Own Armature

If a specific type of armature is not available through your art supply store, the store will most likely be able to supply you with the Almaloy Wire necessary to construct your own design. Other materials necessary can be purchased from your local hardware store. These include a pipe with flange attachment and a baseboard, "T" fittings that will enable you to attach the wire where necessary, and a few screws to attach the base flange to the board. Working with professionals at a hardware store or art supply store to choose the proper items is both fun and invigorating.

Troubleshooting/Questions

The primary difficulty with armatures, in almost all cases, is that the weight of the modeling material placed on it is greater than it was designed to hold. The piece will fall or tilt. You wouldn't expect to load the trunk of your car with ten tons of clay and not have some difficulty driving…would you? The same goes for overloading an armature.[1]

Can an armature be reused?

Yes. Both the armature and the sculpting medium used on it can be reused, unless the medium is straight plaster. Do not expect to save the sculpted piece though; it will be destroyed in the mold making process in all but a few cases. To remove a water-base clay model from a standard armature, you need to follow several steps: wait until the clay is leather-hard, make cuts along key separating areas, and peel the model from the armature and repair the incision cuts.

[1] See Appendix F, Material Requirements Usage Chart.

If the Almaloy Wire breaks when adjusting or moving it, can it be repaired?

Not really. The Almaloy Wire or aluminum wire is a pliable metal wire and as with anything pliable, over time it will break. A coat hanger will snap after continuous flexing. Almaloy Wire will hold up for years if not overly flexed. I have seen only a few cases, where arms were moved back and forth and up and down, and the wire finally gave out; but this was after several years of hard use.

Do a mold and cast have to be made over the piece on the armature?

Yes - in most cases when oil-based clay, wax, or plaster is used. When water-base clay is used the clay can be removed after it is leather-hard without making a mold or cast.

CHAPTER 5

Modeling Stands

A MODELING STAND SHOULD NOT BE CONFUSED WITH A pedestal. The stand is used for modeling a piece of sculpture at different heights, whereas a **pedestal** is normally used to display a finished piece of sculpture in a gallery or at a show. The pedestal, solid on all four sides, is laminated white or black micarta.

There are weight restrictions on modeling stands depending on their height; be aware that stands can become top heavy and may tip if more than the recommended weight is placed on the working surface. They also have a rotational device so the stand's top can be easily turned. They are made of wood or metal and have legs, usually with casters as wheels.

One feature which differentiates one stand from another is the method used to raise and lower the stand's top. One method of raising and lowering is by pipe, the top's position being secured with a set pin through a hole drilled in the pipe. The top is raised and lowered with a twisting motion of the hand. A second method of raising and lowering the stand top is by a crank working through a gear system and secured when the crank has been stopped. Lastly, there are hydraulic stands, such as are used in mechanics shops, with a flat metal top and a foot pedal to raise and lower the working surface.

The most common studio, or classroom modeling stands are made of wood or metal having three or four legs. A pipe attached to the stand's top works as a center post to raise and lower the working surface. The three leg stand is designed for working in an area with uneven floors, such as an old mill or loft studio. The four leg stand is designed for working on even floors, such as in classrooms in conventional schools or universities where the floor is relatively level and secure. The legs are tapered flaring out from the top to the bottom base, and welded or screwed at two levels for stability. The legs are fixed and immovable, but the tops can be removed and are usually taken off the base unit when the stand is transferred to another location. With the heavier crank type of stand, the legs fold for easy transportation

and the stand's top is removable. All the tops are waterproof laminated micarta on press board, or a similar material, usually made from kitchen sink top cutouts from the home building industry.

If the modeling stand has wheels, they will be made of heavy duty rubber with locks so they can be secured when the stand is set up in the studio or classroom. These wheels are called **lock casters,** each having its own toggle type locking device preventing the wheels from turning.

Trays to hold tools can be attached to the stands, usually the smaller lighter sculptors' modeling tools for use with clay and plastilina.

Most modeling stands are made for modeling with moist clay or plastilina and for pieces weighing no more than 250 pounds, the maximum weight used by most sculptors being 100 pounds. Larger pieces would be modeled standing on the floor. Crank type stands can hold greater weight (up to 750 pounds) since they are raised and lowered with a gear mechanism and a hand crank.

Heavy Duty Stands

The following stands are used by serious dedicated sculptors, usually professionals. All are designed for standing to work; sometimes bar stools are used for sitting for larger projects. The **Hercules Stand** is the heaviest duty modeling stand on the market, can be folded for transporting, and is raised and lowered with a hand crank with internal gears. It has an extra large removable top that is reinforced with wood and metal. When raised, the stand is 47 inches high and will hold 750 pounds. It can be shipped by UPS, usually in two separate cartons.

The **Eldorado Stand** is the second heaviest crank stand available, with the same basic design as the Hercules but of lighter weight materials. It is probably the most preferred of the folding models; it is easy to place in a car trunk and is light enough to be easily handled by men and women alike. When raised, it is 46 inches high and can hold 200 pounds of modeling material.

The **Studio Stand** is a four leg floor adjustable stand of heavy welded steel with a reinforced top. The floor adjustment is accomplished by screwing down one of the four legs with an adjustable thread. The top is raised and lowered by hand with an internal pipe and secured with a set bolt through holes in the pipe. The top is heavy duty and sits in a reinforced metal frame for added strength.

Hercules Stand

Eldorado Stand

Studio Stand

Studio and Classroom Stands

Because of their designs and affordable prices the following stands are best suited for use in studios or classrooms. The **College Stand** is a four leg, welded angle stand with a top of waterproof micarta and pressboard which is raised and lowered by hand. It has lock casters, weighs only 28 pounds for easy moving, and can hold 250 pounds.

The **Jolly King Stand**, a three leg, welded angle steel modeling stand with lock casters can hold 150 pounds of material. It has a waterproof top raised and lowered by hand in the center pipe method. The College and Jolly King Stands are both well suited for schools and universities where they might be subject to strong wear and tear by the students.

College Stand

Jolly King Stand

The **Norska Stand** is a four leg wooden stand secured with nuts and bolts, with lock casters. It has a square wooden shelf built into the center of the stand for tool storage. Tool trays, which slide out from under the stand's top, can be ordered separately at an additional cost. This stand can hold up to 150 pounds.

The **Helsinki Stand** is a three leg wooden stand with lock casters and a waterproof top. Able to adjust easily to uneven floors, the stand holds up to 100 pounds of modeling material. A triangular wooden shelf at the bottom of the stand provides support and can also store tools.

Norska Stand

Helsinki Stand

Due to the high cost of production and shipping, a new modeling stand has been introduced ingeniously engineered to have the same functionality as a full-size stand, but being about one-third of the floor model's height. **The Torino Table Top Stand** is recommended as a supplemental classroom and traveling modeling stand. It is easily transported to a work place where a bench serves as the primary work area. The height of its melamine top is adjustable using the raising and lowering pin.

Torino Table Top Stand

The **Stone Carver's Stand** is an extremely heavy wooden four leg stand with extra reinforcement on the top and at the base. It can bear the weight of stones up to 800 pounds. When the top is removed, a recessed hold area can cradle large stones with sand bags for comfortable work. When the top is in place

it locks with the recessed area so it will not shift. The stand does not come with casters but they can be added. You can purchase the casters at a hardware store and attach them to the stand's legs.

Stone Carver's Stand

Troubleshooting/Questions

What stand is better, wood or metal?

It is hard to say. I prefer the wood stands because I just happen to like the feel of wood better. However, if I were to recommend a stand to an eighth grade classroom teacher, I would go with the metal stand, solely for its durability.

Why three leg and four leg stands; what is the difference?

The three leg stand is designed for uneven floors such as those found in the old loft studios in New York City and in Italy. The four leg stands are designed for even set floors where balance is not a problem. Both types hold weight equally well.

What do I do when I lose the holding pin?

You can buy a heavy gauge nail and use that (as I have quite often done) or contact your supplier and have another sent, usually at small or no cost.

How do the lock casters work and will they hold?

The casters lock and unlock with a flipping device in the caster, much like the locks on your home windows. When the stand has been rolled to the desired location, simply set each of the locks on all the wheels. Lock them all for best results. They hold pretty well but remember that if a great weight has been placed on top of the stand and if pushed just so, the stand may well tip over. Use common sense.

Where can I purchase a pedestal and have a piece mounted?

You can usually find a source in your local yellow pages under Art Supplies or at larger home decorating centers. If there are none in your area, see Appendix B for a sculpture organization which may be of assistance or contact Sculpture House, Inc., Customer Service, 405 Skillman Road, Skillman, NJ 08558, Phone: 609-466-2986; FAX: 888-529-1980; e-mail: customercare@sculpturehouse.com.

CHAPTER 8

Stone Carving

TO CARVE THE MANY TYPES OF STONE AVAILABLE SCULPTORS use the basic handheld carving implements, various hammers, and specialty tools and accessories.

Stone

There are so many types of stone used in this field, it would be difficult to name them all, so I will mention the primary types and a few exotic stones that I have found interesting.

Most instructors agree that a pure even stone is best for carving by most students. The reason is simple. With a pure even-colored stone the carving will not be dictated by any color or veining. If a student were carving a face in an exotic multi-colored stone, however, veins would most likely appear diagonally, horizontally, or even in a circular configuration across the face, ruining the effect and the piece. I have often seen this happen. Since there is little or no veining in a pure stone, this will not occur, and the piece will flow naturally with the instructor's guidance.

The primary carving stones are **Italian alabaster**, either **translucent white** (where light will pass through the stone) or **opaque white** (where light will not penetrate the stone), and **soapstone (talc block)** which will be mostly light and dark green in color. Other common stones used in carving are marble, sandstone, limestone, tiger eye, wonder stone, and granite.

Stone is usually classified into four groups each defined by its hardness or carvability. **Soapstone** is the softest. Some carvers include serpentine and Eskimo soapstones in the soapstones. There are soapstones from Taiwan (greenish with iron deposits), Canada (pink mixed with cream), India (red, green and black), Kenya (dark olive green), and the southern U.S. (black). All of these are not readily available and may be somewhat harder than the material commonly referred

to as soapstone and therefore not suitable for beginners.

Alabaster is the second hardest and is considered a medium hard stone as are sandstone and limestone which are abrasive stones. It comes in many colors: Tiger's Eye Grey and Tiger's Eye Red, Bruno Carmello, Italian Brown Agate, Oyster Shell, Red Vein, White on White, Raspberry, Root Beer, Orange, Creamsicle, and Tropical, to name a few. However, the favorites of sculptors everywhere are the translucent and opaque white alabaster. I would suggest the green soapstone and white alabasters as carving stones for beginners. All these carving stones are available at the larger sculpture supply houses or stone suppliers.

Used by students throughout Europe to speed up the carving process, **alabaster cylinders**, also known as stackable stone cylinders, are available in several sizes.

Marble is the third hardest stone, the hardness varying with the geographic locale from which it is mined. Vermont marble is very hard; Italian marble (the highest grade known as Carrara marble) has a standard medium hardness as does Colorado marble. Carrara marble is favored by professionals; the number one pure white is by far the best. Also known as statuario, this last stone was used by Michelangelo. (I have not seen this grade of stone in the United States since 1978 when a friend had several pieces and even then, no one was permitted to touch the pieces he had.) Other marbles include Statuario Puro, Bianco Pi, Statuario Venato, Bardigilo, Belgium Black, Portuguese Rose, Vermont White, Tennessee Pink, Colorado Yule, California Crystal, Chinese Black, Alabama White, and Danby White. They range from soft to extremely hard. Consult your supplier for the hardness of marble best suited to your needs.

Granite is the fourth hardest carving stone. This is recommended for only the most advanced sculptors having a lot of time to spend on the piece.

Most of the quarried stones are mined in sizes of between 50 and 100 pounds. While larger stones are available, smaller stones must be cut from these larger boulders, and an additional charge is normally attached to the per pound price to cover the cost of labor and blades. If everyone could place a 75 pound stone on his or her mantel or bookshelf all would be fine, but few people can, so stones are cut to a more reasonable size, usually with two to three flat sides and one rough. Cutting thin slabs is extremely difficult and normally not done due to possible breakage. When a stone is cut to size the entire boulder must be purchased before cutting; you are also buying the waste, as in a butcher shop, you buy the meat before, not after, the fat is trimmed. In order to get a stone with a dimension of 12 cubic inches a boulder of between 200 and 300 pounds may be required. A one foot cube (12" by 12" by 12") will weigh approximately 108 pounds since the density factor of most stone is 1 cubic inch to 1 ounce in weight.

When choosing a stone to work with, look for any fracture lines, large veins, iron deposit areas, or fissures. These may cause breakage when the piece is being carved. Also, tap the stone with a light hammer in various areas; you should get a clear ringing sound. Somewhat like giving a physical to the stone you are considering for purchase!

A final note, always consult your local art supply store for details on its stock.

Stone Carving Tools

The basic steps in stone carving are design, percussion removal in three stages (roughing, secondary shaping, and smooth finish), hand rasping, sanding and finally finishing and mounting. The stone carving tools used to per-

form these functions are considered handheld unless specifically described as pneumatic or electric. The basic tools needed are the point, rake (tooth chisel), the flat straight chisel and a hammer, all of varying sizes and weights. All are made of high carbon steel.

The **point** removes the primary bulk material and comes in three sizes, small, medium and large. All taper down to a four-sided point and the thickness, or size of the point, will be determined by its heaviness. The smaller the size, the finer or lighter the point.

Small, Medium and Large Points

The **tooth chisel or rake,** for the second stage of removal, is a flat straight chisel with slightly beveled teeth. It is available in four basic widths, the smallest having four teeth, the next five teeth, the next six teeth, and the largest having eight teeth. The tooth chisel is principally used in the geometric reduction of a larger piece of stone.

4-Tooth and 8-Tooth Chisels

The **straight chisel** is the finishing tool used before the final abrasive finishing, rasping, and sanding. It has a straight edge with a slight bevel of possibly 30° and is available in three sizes, small, medium, and large.

Small Straight Chisel

Medium and Large Straight Chisels

There are also **specialty tools** which are not normally used in standard carving but by intermediate and advanced carvers for added assistance in multiple projects. They include the **diamond shaped chisel**, used for parting ferrules width-wise. (In stone carving there are no "v" or veining tools as in wood carving; points do this job.) The **rondel** is a rounded curved tool for concave carving; the cutting edge is a round bevel. The **caped chisel** is used for rounding and concave/convex sculpting; it is used by the more advanced stone carvers in what may be described as challenging situations!

Diamond Chisel

Rondel

Caped Chisel

The **straight gouge chisel** is used for making trench-like, or half-round grooves. All these tools are available in one standard size.

The **Reduction Chisel** is a larger, more substantial tool that makes it easier to reduce the geometric form of a stone to a more reasonable carving size.

Straight Gouge Chisel

Reduction Chisel

The **fish head** is an outward, "c"-curved tool that, held sideways, looks like a sunfish. Its cutting edge is flat on the outer curve and is used to make slight long strokes similar to those made by a long bent gouge in wood carving. The **needle nose point** is an inward shaped point (concave) that comes to a dramatic point used in removing bulk stone.

Carbide tipped tools are stronger than standard carbon steel tools; as such they will need less frequent sharpening. However, they will not take a harder blow as most people believe. This is because the carbide, although stronger, is much more brittle than carbon steel and hence more susceptible to shattering or breaking on hard impact. Please take this into account when using these tools; they cannot and should not be hit harder.

Available in the standard handheld style, they come in point and chisel shapes in two sizes. They are also available in a pneumatic series including a straight chisel, three-point tooth chisel, and point.[1]

The carbide tips are welded in high carbon steel shanks, and, if not used properly, will shatter or break loose from the welded area. Always use a light touch at a 45° angle when using carbide tipped tools. The fragile carbide will shatter if the tool is struck too forcefully.

Carbide Tipped Chisel

Carbide Tipped Point

Miniature stone tools are made of high carbon steel and were developed for detail work (small tools were formerly not available). They are about a fourth the size of the standard tools. The tooth chisel comes in two, three, and five tooth points that are very fine. There is a four point flat tooth chisel, a one of a kind, very useful in finishing. There are also a diamond shaped point, a rondel, and two flat chisels. The shanks on all these tools are half the size of those on standard tools, used for fine detail work and delicate definition.

Stone carving hammers come in three weights and are made of soft iron, so the percussion is easier on stone, tool, and user. There are two standard sizes of steel heads which are measured in pounds but these are not commonly used due to the strong percussion on the tools and stone. The sizes of the heads are: 1 pound used for small detail work, 1½ pounds for the most common type of carving, and 2 pounds for larger carving. The handles are heavy strength, the hammer heads attached to the handle through a center hole in the head with several steel wedges ensuring the fit. Unless you are very muscular, the 1½ pound hammer is the tool of choice.

1 lb. Hammer

2 ½ lb. Hammer

Bush hammers are available in three sizes ½, ¾, and 1 inch, measured along the outside edge of the tool. The face of the tool is square and is similar to a waffle iron having small

[1] Pneumatic tools are discussed in greater detail later in this chapter.

points on the face. The tool is used like a hammer and is for surface reduction of stone. The **bush and pick** tools are available with ½ and ¾ inch face surfaces on one end (the bush) and with a point on the other end (the pick). These are also used to reduce large quantities of bulk stone in the roughing out stages.

A **frosting tool** is a handheld tool, its face being a bush-shaped cutting surface with a percussion hitting end, but somewhat more rounded. A reduction device for fast and easy removal of bulk stone and for texturing, it comes in three sizes: ½, ¾, and 3/8 inch.

A B C

A. Bush Hammer B. Bush and Pick C. Frosting Tool

A **rotary wheel (fifth wheel)** is a device made of heavy duty steel bands with ball bearing rollers for supporting large pieces of stone, weighing up to 3,000 pounds. The name fifth wheel derives from the manner in which train engines are turned around in station yards to head back in the direction from which they came. The engines are placed on a fifth wheel in the yard, turned around, and attached to the cars for the return trip. When a stone is so large that it is difficult to carve in a stationary standing position or from one spot, a carver places it on a rotary wheel so he can turn the carving rather than walk around it. I've seen a posing platform electrically attached to one of the larger rotary wheels with the model rotating slowly 360° so students could view all sides of the pose easily.

Fifth Wheel

Carving Sets

These sets contain a basic set of carving tools placed together as one unit. The **basic carving set**, designed for the beginner, includes the primary tools necessary to carve simple pieces, plus a 1½ pound hammer, in a canvas roll. The **professional stone carver's set** contains all the standard tools, plus a heavy hammer, in a canvas carrying roll. It is meant for the more advanced carver. The **miniature stone tool set** contains standard tools, small detailing tools, and a bush hammer all geared for detailing work by the amateur as well as the more advanced professional. The **stone sculpture set** is probably the most advanced set available. It includes standard carving tools, a bush and pick hammer, a firmer straight chisel which is a one of a kind oversized heavy-duty flat chisel, a 1½ pound hammer, goggles, a sharpening stone, and finishing paper, all in a wooden carrying case.

Pneumatic Handpieces and Tools

Before going into descriptions of specific pneumatic tools, I will explain what the pneumatic handpiece and tool unit consists of: you need an air source, most likely provided from a compressor with a 3-gallon tank (larger if you don't want to hear the motor running all the time). The compressor should have an

oil attachment and a moisture filter. It will come with a ¼ inch hose for attachment to the tools to be used with the compressor. A one horsepower motor is generally enough since the handpiece will operate on 70 PSI (pounds of pressure per square inch). When buying a compressor, do not let the salesperson confuse the PSI needed to operate the handpiece with the pressure of the inside of the tank, or the horsepower needed. A 3 gallon tank and a ¼ horsepower motor will work fine, but, although less costly, the motor will run continuously and will be noisy. (For the first few years I put mine in the room next to where I was carving or outside in a shed with a longer extension hose to my workbench.) With a larger tank (50 gallons) and a motor with more horsepower, the motor will only turn on occasionally once the pressure is built up to maintain the pressure. This type of unit is normally used in large shops where a number of handpieces run off of one large compressor. It is not normally for home use.

I recommend a **quick disconnect** for detaching the handpiece easily from the air hose, and a fine air valve to reduce (or cut off) the air flow to the handpiece so it will not bounce around the workbench when not in use. Without some type of shut off, the air will continue to flow directly to the handpiece and it will flop around like a fish out of water. Both can be found in NAPA auto parts stores at reasonable cost.

Quick Disconnect

A **pneumatic handpiece** is attached to the hose and holds the tools which fit loosely in the handpiece and are activated with pressure on to the surface to be cut. **Pneumatic tools** are steel cutting shafts that look like standard tools, except they have a turned ½" round shaft end. They are available in carbon steel for wood carving and carbide tipped steel for stone carving. The two piece unit runs on air power that is again separate from the tool and handpieces.

Although there are several sizes of handpieces, the most common are the 5/8, ½, and the ¾ inch. The lighter-weight tools are easier on the arms, especially after continuous use and vibration. Smaller and larger sizes are available from Italy and several U.S. manufacturers, but they are not stocked by most suppliers for lack of demand. They can be special ordered, however. The size is measured by the piston size in the handpiece shaft, which also determines the weight and diameter of the outside of the handpiece. The smaller size handpiece is the choice of most carvers since it weighs less and is easier to handle with stones ranging from 40 to 200 pounds.

5/8" Handpiece for ½" Shank

The handpiece is held in the right hand and the tool shaft, after it has been inserted into the handpiece, is held in the left hand (left handed users will reverse this). When pressure is applied the tool will begin striking the stone in about 1 inch sweeps. Rotary hand grinders and sanders are available but normally they are used by professionals and steel welders for finishing.

Pneumatic tools can reduce bulk material in about one-third the time standard handheld tools require. Any serious carver will never go back to carving by hand once he or she has used a pneumatic.

The piston, inside the housing of the handpiece, is very sensitive to dirt and dust, and should be kept clear of stone refuse when not

in use. The majority of operational problems are due to dust clogging the piston causing it to stick or seize. The cost of cleaning usually takes this possibility into account.

As I mentioned, a **pneumatic tool** works in conjunction with a handpiece. There are two ends of a pneumatic tool, one is the cutting surface and the other is the shank. Place the shank of the tool in the shaft of the handpiece and apply pressure. The piston within the handpiece causes the striking motion of the tool. The higher the air pressure used, and the greater the pressure applied by the carver to the stone or wood, the faster and the harder the striking action. The appropriate time period for continuous use of these tools is about 20 to 30 minutes, since the vibration and rapid percussion tire most people out in that time.

The majority of handpieces have a ½ inch shaft. (There are smaller, even miniature, handpieces that have 5/8 inch and smaller shafts, which work with smaller shank pneumatic tools. These are not interchangeable with larger handpieces and are in short supply; they can be found in Italy.

In addition to sculptors' pneumatic handpieces which are cylinder shaped, there are mechanics' handguns (with triggers used to remove rivets on mufflers) that also work on the pneumatic air system. These guns do not really work well for sculptors although the principle is the same.

There are three general types of pneumatic tools that work with the various handpieces. They are **carbon steel stone carving tools**, **carbide tipped stone carving tools**, and **carbon steel wood carving tools**. All will have ½ inch shanks to fit the standard handpieces. Sizes and styles are limited by demand and by production facilities both here and abroad. The common shapes used in stone carving are **points**, **rakes**, and **straight chisels**, and in wood carving are **short bent**, **straight chisel**, **gouge**, **fish tail**, and **parting tool**.

A. Carbide Tipped Tooth Chisel
B. Carbon Steel Tooth Chisel (Rake)
C. Carbon Steel Wood Carving Straight Chisel

Carbide tips are available only in the stone carving series on a smaller point, tooth (three-prong) chisel, and a straight flat chisel. Please remember, carbide will shatter if hit with too much force on a hard stone.

The largest producers of pneumatic handpieces in the United States are Trow & Holden and Bicknell; in Italy, Cuterri. The American tools seem to hold up superbly; any difficulties are easily corrected and the cost is reasonable. With the Italian handpieces this is generally not the case since they are usually returned to the manufacturer in Italy.

Electric Tools

While pneumatic tools and handpieces work on a percussion method, back and forth, electric tools work by a rotary method. They run on household current and normally have foot rheostats to govern the RPM (rotations per minute) of the tool bits. The basic components are a motor (1/10, 1/8, or even 1 horsepower), a turning cable (replaceable when worn) covered by a sheath that is attached to a handpiece (also detachable and in a variety of styles), and bits or burrs of various shapes and composition that attach to the handpiece usually with a ¼" (with smaller tools 1/8") shank.

There are basically two sizes of electric tools, small and large. Both sizes can be either table top or wall mounted. Most larger ma-

chines have an option for a variable speed foot rheostat to control the RPM (normally 14,000 maximum) from zero to the maximum. Or some have a dial set device that holds the speed at set intervals within the minimum and maximum range of RPM. The smaller machines have interval settings, usually in the handle of the machine, set at low, medium, and high. There are hundreds of different burrs that can be attached to these machines available in craft stores or specialty houses for sculpture.

The **Foredom Power Tool** is probably the most versatile and all around best machine that I have seen. It has standard replacement parts that are consistent in size with those of other manufacturers and that last forever. The foot rheostats turn at 14,000 RPM with a 1/10 horsepower motor. The set comes with a hanging device, a set of burrs, and standard handpiece. The **Dremel Motor Tool** is more of a craft or finishing tool where the entire device (motor and burr) is held in one hand and the speed is regulated by a setter. The motor is encased in a Lexan housing for durability, and it comes with a set of grinding, polishing, and buffing burrs.

Troubleshooting/Questions

How do you clean marble?

Marble is usually cleaned with non-corrosive abrasives, such as scratch-free Comet. Some sculptors use Clorox or even toothpaste. Larger pieces may be sandblasted by professionals.

What is the best all around pneumatic handpiece?

The 5/8 or ½ inch handpieces are the most commonly used because of their size and weight.

Is there a difference in temper between wood and stone tools?

Yes. The stone tools are slightly harder due to the wear demanded of them. Consequently they must also be sharpened more often.

Why do tools chip off teeth or chip on their edges?

This happens quite often to beginners who do not know how, or at what angle, to hold the tools, or the strength they should use when hitting with them. Usually the end teeth or left and right sides of the tool are damaged, rarely the center teeth or midsection of the tool. Most damage is done due to the inexperience of the user, not the quality of the tool. With practice, the beginner will hone his or her skills to prevent this from happening.

CHAPTER 9

Rasps & Rifflers

Wood, Stone & Plaster

RASPS ARE DEVICES USED IN THE FINISHING PROCESS AFTER basic carving is completed. These can be used for reducing wood and stone and are sometimes used in finishing metal. They are double-ended tools with small, medium, or large teeth and are made by hand, each tooth hand punched. Most rasps have a radial curve on at least one side but some may be flat. The teeth are located on both sides as well as on the edges.

The Milani's (cousins) in Italy are the primary manufacturers of rasps; they are best known for the fine quality of their products. Chinese-manufactured rasps are also available and are improving in quality yearly.

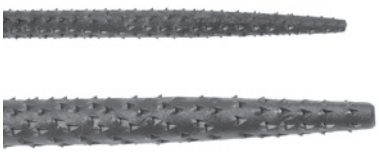
Rasps range in size from the miniature to the heavy 10 to 12 inch. There are basically four styles of rasps and a variety of shapes to suit most applications. The styles are **fine cut** with small teeth, **medium cut** with medium teeth, **coarse cut** with larger teeth and, **miniature rasps** with extremely fine teeth for detailing work. The size and placing of the teeth will vary with each tool since they are made by hand.

Rasps can be rounded like a spoon, pointed like a knife or in any number of other shapes. Importers have illustrated catalogs to help you choose the appropriate rasp to use.

Carbide coated rasps come in basic shapes and are coated with a diamond or carbide finish. The coating, like little chips, may or may not flake off depending on the producer. These rasps are usually coated in the U.S. using Italian tools or tool blanks.

The **rat tail rasp** has teeth like a hand-held rasp but is completely rounded and generally used with an attached handle.

Rat Tail Rasps



Rat Tail Rasp Ends

Knife rasps are so named because they have the shape of a knife blade. The rounded end or handle is a rat tail rasp in itself with punched teeth over the entire surface.

Knife Rasps

Knife Rasp Ends

Plaster rasps are rounded and concave, like a spoon, at both ends unlike conventional wood and stone rasps. They are perforated, much like a cheese grater, with sharpened cutting edges to accommodate the set plaster. This allows the plaster material to pass through the holes so the rasp will not clog up with discarded refuse. The tools come in three basic sizes: 6½, 7 ½ and 9 inch. You may find larger sizes but these are the most commonly used. They are usually rectangular with rounded ends and are made of blackened steel. As with most sculpting tools, they can be used for functions other than plaster work, such as carving soapstone or dried ceramic clay. However, they are primarily used with hardened porous materials that are easily scraped.

Plaster Rasps

Rifflers are usually referred to as jewelry or silversmithing files and are not commonly used in sculpture. Used for finishing just prior to sanding, they have cross cut grooves like a nail file, and are extremely fine. They come in a variety of sizes, are normally made without a handle, and have a plain steel circular end and a filing end.

Rifflers

Cabinet rasps are flat surface rasps used in the cabinet industry as well as in the sculpture field. They are used for fast reduction of large amounts of material. They are half round on the upper side and flat on the lower. There is also a combination style, four-sided with teeth or teeth and a file. The rasps are available in sizes from 6 to 12 inches and are normally held with a wooden handle secured by the tang of the rasp. As the rasp increases in size, the teeth become heavier. The tools are produced in Italy, Poland, the U.S., and in other countries as well.

Fine Cabinet Rasp - Half Round

Coarse Cabinet Rasp - Half Round

We have found two very exciting large rasps in the last few years which are unique and, well, just fun! There is the **riffler file-rasp**, 10" over-sized rasp with a rasp at one end and a riffler at the other. It is primarily used on larger stones weighing over 50 lbs. to allow

for quick reduction. There is also a **circular half round rasp** used in Europe for stair carving. It's essentially a straight cabinet rasp that has been bent to form a circle. It's great for indenting or concave rasping work and is easily hand held.

Circular Half Round Rasp

Riffler File-Rasp

The **rasp brush** is an essential item when working in wood and especially in stone. Since material particles will clog the teeth of almost any rasp, they should be cleaned out when necessary. (The finer the teeth of the rasp and softer the stone, the faster the rasp will clog.)

Rasp Brush

The rasp brush does this cleaning easily and quickly. The accessory has metal brushes facing at a 30° angle toward the holder. Simply pull the clogged rasps over the bristles at a perpendicular angle a few times. I nail my rasp brush to a dust pan brush so I can dust off the piece and clean the rasp at the same time.

Troubleshooting/Questions

Why does the rasp wear out so fast?

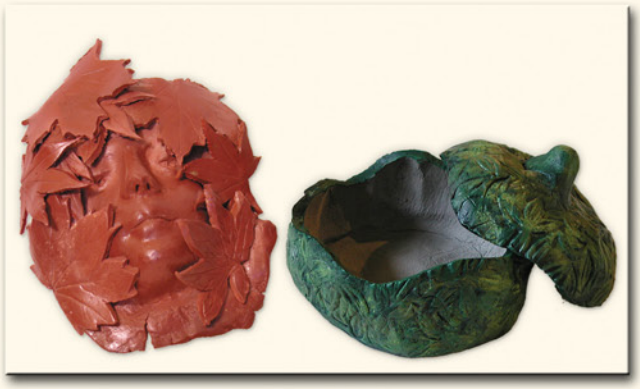
Generally because the rasp has not been cleaned properly, and greater force has been applied when running the teeth against the surface being cut. Don't forget to use a rasp brush to clean all of your rasps.

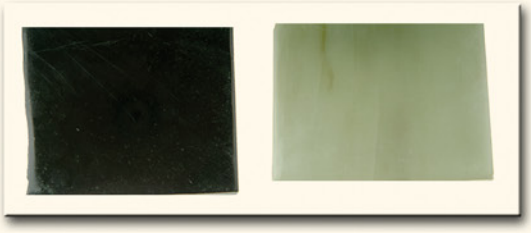
Why do some rasps wear faster than others?

The temper determines the hardness of the steel cutting edges and their ability to hold up under rasping. The hardness and coarseness of the stone being carved is also a large factor; for example, sandstone will wear out a rasp faster than a soft soapstone. Tooth size and firmness of stroke have a minor effect. Some think that manufacturers offer tools of different quality, but if the proper steel and temper are used they should all hold up equally well.

Index

Please refer to the Appendixes (pages 75-117) and Glossary (pages 119-144) for additional information.





A Sculptor's Guide To

Tools and Materials

Second Edition

Plastilina

Direct Modeling Materials

Modeling Tools and Accessories

Armatures

Modeling Stands

Mold Making & Casting

Wood Carving & Stone Carving

Rasps & Rifflers

Carving Accessories

Pottery & Ceramic Clays

How Sculptors' Tools are Made

Material Requirements Usage Chart

$21.95
Price subject to change without notice

ISBN 0-9631867-2-8

ISBN 096318672-8
52195
9 780963 186720