

Introducing Pottery

Chapter 2 Clay: Geology, Chemistry and Clay Bodies p.16

Chapter 3 Methods of Working p.28

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INTRODUCING POTTERY

the complete guide

Dan Rhode

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To my children, Aidan and Will.
May your quest for a deeper understanding always enrich you.

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Contents

	Acknowledgements	4
	Introduction	6
1	Ceramic History	8
2	Clay: Geology, Chemistry and Clay Bodies	16
3	Methods of Working	28
4	Heatwork and Firing Clay	68
5	Glazes: Components, Chemistry and Fired Characteristics	74
6	Mixing Glazes and Improving Performance	84
7	Decorating Techniques	94
8	Correcting Glaze Faults	106
9	Glaze Formulation	112
10	Firing Kilns	122
11	Getting Started as an Artist	140
APPENDICES	Technical Information	150
	Cone Table and Firing Schedules	154
	Studio Safety and Environmental Health	155
	US and UK Ceramic Terminology Equivalents	156
	Recipes	157
	Bibliography	158
	Suppliers	158
	Glossary	159
	Index	160

Introduction

There are many books available to the person interested in learning the basics of pottery making, but many fall short of giving any more than the briefest of introductions to the methods and equipment used. Using these sorts of books can be fraught with frustration as basic forming, firing or glazing problems arise that are not adequately (if at all) addressed in the text. What the more inquisitive and thorough clay artist needs is a book that provides information about both the basic and somewhat more advanced issues of clay-making in a comprehensive yet easy-to-use format. Many, many books will lead the beginner through the stages of throwing and simple glazing, but in order to succeed in making clay objects, the successful potter needs more than that. That's where this book comes in.

Introducing Pottery: the Complete Guide is just what its title describes: a book that gives a more complete overview of the methods, techniques, equipment and theory behind creating with clay. This book aims to provide the reader with a user-friendly, well-organised source of information that will allow the beginner and more advanced artist to solve problems as they develop and keep improving their skills.

Getting started with clay can be intimidating, while moving into new areas of working can be equally daunting. The sections in this book on throwing, handbuilding and sculpting will allow people with previous experience with clay to develop new skills while taking advantage of their previous experience. Many techniques are illustrated and detailed, and the uses of specialised tools to get specific results are explained. Beginners will find the step-by-step illustrations helpful when making their very first pieces as well. The development of an array of hand-made tools is encouraged to promote personalisation of work.

An in-depth look at glaze making, formulation, application and firing will help most artists move beyond the confines created by a lack of understanding of the basics of how glazes work. Personalising this process helps to make an individual's work stand out. Furthermore, an understanding of the fundamentals of formulation will not only help potters make glazes that are safer and more durable but also aid non-functional artists to go beyond the mainstream 'school use only' glazes to ones that really speak to their aesthetic.

Learning about the differences in firing techniques is important when getting started so that resources are allocated well and a suitable method can be used. The section on kilns provides users basic information on what is required to set up a variety of kilns, and some of the ways of preparing, loading, and firing electric, gas, wood and raku kilns. Firing schedules are included to help ensure success, and theoretical information is included so that users can go beyond the basics and move in the direction that best suits their work. For those that already have some experience, but would like to continue to a more advanced level, encouragement is provided to the would-be professional artist to help them move beyond the safe sphere of their early learning environment to become an entrepreneur and business owner. The book provides information on the first steps to take to start out on your own.

As a practice, working with clay requires patience: patience to learn the skills required in order to achieve specific results, but also patience for the material to go through the changes involved. Clay as a medium *demands* patience on the part of the craftsperson; there is no way to hurry the process, and

this is sometimes the part about clay work that draws people in. Additionally, pottery is not an immediate art form, neither in time nor proximity. Whereas the fibre artist sews the fabric, and can see the evolution of their work in their own hands, much of what the clay artist ‘creates’ happens in a very hot kiln away from prying eyes! This element of chance and mystery involved with making clay enchants many who spend their days shaping this basic material. This book acknowledges these challenges, and promotes ways of taking advantage of clay’s intrinsically complex characteristics.

Getting some degree of control over the materials making up clay and glazes is tantamount to success with clay. And knowledge about the make-up of the materials will allow any clay artist to creatively solve problems as they arrive. The information in this book will allow a beginner and more advanced craftsperson to evolve their work in a step-by-step approach, giving them the tools with which to evaluate and learn from their successes and failures. Frustration arises when the mysteries that arise as the work progresses are not able to be evaluated, and this is when people normally give up. One aim

of this book is to provide clay artists with enough information so as to not overwhelm but to clarify.

Ultimately, this book provides all the information needed to get the beginner up and running, with the aim of supporting and encouraging those who have just started out. It will then allow them to develop their skills and progress beyond this level to a more knowledgeable stage, while those who have perhaps already started out in classes will find this book a fantastic resource to fill in all the gaps once they have learnt the basics. In short, a book for beginners and beyond.

Making clay objects is a fascinating process; a process fraught with moments of bliss as well as frustration. Having a helpful guide along for the journey is incredibly beneficial. The information provided in *Introducing Pottery: the Complete Guide* is meant to serve in just this way.

2

CLAY

Geology, Chemistry and Clay Bodies

THE ORIGINS OF CLAY

PROSPECTING FOR CLAY

CLAYS FOR SALE

CLAY-BODY CHEMISTRY

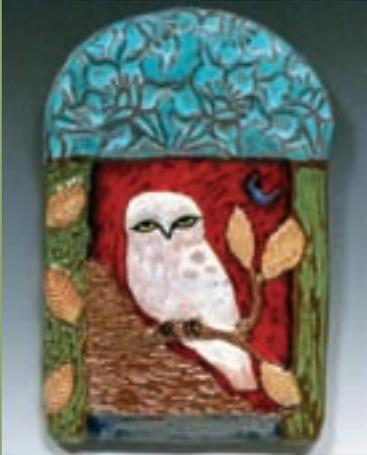
CLAY-BODY ADDITIVES AND COLOURANTS

CLAY STORAGE

PARTICLE SIZE, SHAPE AND PLASTICITY

MAKING A CLAY BODY

SAFETY



THE ORIGINS OF CLAY

In the simplest terms, clay is made of rock dust. Natural forces break down various types of rock into powder, and this powder can then be fired in a kiln to become rock-like again. But this time, when it is fired, it might be in the shape of a bowl, mug, plate or sculpture. In return, all the pottery we humans make will someday return to the earth and become part of a mountain to be climbed by our descendants. Pottery is just one stop along the grand mineral cycle taking place on Earth!

The Earth's crust is made of a variety of minerals, primarily oxides, which are combinations of various atoms with oxygen atoms. By far the most common type of mineral is feldspar, a common type of rock. All feldspars of interest to potters contain two main oxides, silica (silicon dioxide) and alumina (aluminium oxide), plus any of a variety of additional oxides. After a profound amount of weathering in nature, the silica and alumina in feldspar become chemically bound to water molecules. Tiny particles of this trio are the basic building blocks from which all clay is derived.

In nature, clays tend to be of two types: primary and secondary. Primary clays are those that have managed to stay relatively close to the rock from which they were sourced. Secondary clays are those that have travelled away from the rocks from which they were created, mainly due to wind and rain blowing or washing them away. Each type of clay has a few identifying characteristics: primary clays tend to have larger particles and tend to be 'purer', i.e. containing fewer impurities such as iron; while secondary clays normally have smaller particles and a greater proportion of impurities picked up as they moved. The most common name given to primary clays used by potters is 'kaolin'. The name often given to secondary clays is 'ball clay', as the fine particles in secondary clay make it sticky enough to form a ball. There are many, many kinds of primary and secondary clays, each with its own characteristics. These clays are collected from many different locations: a mine or quarry, or even someone's back garden. The makeup of the clay will depend on its history, and no two clays will exhibit exactly the same qualities under all conditions.



Rock outcroppings like these will eventually be worn down by natural forces. The tiny bits of rock that wash and blow away may someday be part of a clay artist's creation. *Photo by the author.*



Flowing water moves tiny clay particles around, depositing them when the speed of the water slows down. *Photo by Fiona Holland.*

PROSPECTING FOR CLAY

Ready-to-use clay can of course be bought from suppliers, and this will be discussed later in this chapter (see p.21). But for those looking for a bit more adventure, harvesting wild clay can be rewarding and educational. Depending on where you live, finding clay in your local environment can be very easy or quite difficult. If you know a bit about your local geology, or you have done a bit of gardening, you probably already know something about what you will find in your area. In some places, huge clay deposits lie just under the top layer of soil and vegetation, and digging anywhere will result in finding clay.

Other areas might have several feet of topsoil, which is mainly organic matter, and all of this would have to be removed before clay can be found. Bedrock predominates at the surface in some regions; in other places the ground is almost exclusively sand. If it appears that finding wild clay will be difficult, before giving up, go to a local river or lake and have a bit of a poke around. Put on your boots and, if it is safe, have a bit of a wander up the stream or along the shore and grab handfuls of the substrate.

Sometimes feeling for clay is the best way to find it. Search along the banks, especially in areas where things have been eroded, and look for exposed layers of clay.



top Sometimes clay can be dug by hand from the ground, usually where exposed by water. *Photo by the author.*

above Dry clay can be harder to identify as being usable clay since it is difficult to test on site. *Photo by the author.*

Is it clay?

Most people know wet clay when they feel it: it is slippery, slimy and sticky. Perfectly usable clay can be found in its dry state as well, and may not exhibit any of these qualities.

When a potter goes out looking for 'native' or 'wild' clays, there are a variety of tests that can be done to recognise whether a clay is worth harvesting or is better left alone. Reasonably good clay can be identified quite quickly using simple tests.

First, once the clay is wet, try rolling it into a ball. If it sticks and does not crumble, you have found clay with sufficiently small particles to be useful. A further test is to simply roll the clay into a coil with roughly the diameter of a pencil, and attempt to wrap it around your finger. If the clay can do this, you have found a good source relatively free from sand and organic matter, and you can proceed to make things from the harvested clay as it is.



top Rolling a ball of wild clay. *Photo by the author.*

above A simple field test for soft wild clay: if you can wrap it around your finger, it may be plastic enough for making pottery. *Photo by the author.*

Determining firing temperature will be next, and the only way to do that will be to include the clay in your next kiln firing and see what happens. Start with a bisque firing, and work your way up to earthenware and then stoneware temperatures. Be sure only to put a small amount of clay in the kiln at a time, and be sure to put it into a small bowl made of a clay that you know from experience will withstand your test to ensure that any wild clay that melts will be contained.

The colour of the fired clay will normally be determined by the amount of iron found in the clay, and this will also play a role in the clay's melting temperature. Clays high in iron will be darker and will tend to melt at lower temperatures, while lighter-coloured clays will have less iron and will melt at higher temperatures. Wild clays will often melt at fairly low temperatures and may be more suitable for use as either a decorative slip or in a glaze; just substitute your found clay for a portion of the clay in a glaze recipe and see what happens. Another way of making use of wild clay is to wedge it into a higher-temperature 'clay body' (meaning a mixture of ingredients that together make up the clay that you use) to add colour. In this way, as long as you do not add too much, you can still fire to higher temperatures while knowing that some of the clay in your pot was found by you, thus making your pieces a bit more personal.

right From left to right: Cone 10 porcelain, orange high fire stoneware, brown stoneware clay, and red high fire earthenware clay on the bottom.

Photo by Jennifer A. Siegel.



If you find clay that does not pass the ball and finger-wrap tests, you can often do a little work on the clay yourself to improve its plasticity. With small amounts, you can simply push the moist clay through a screen to remove impurities such as organic matter and sand. For larger quantities, it is best to dry the clay completely, and then re-wet it in a bucket with plenty of extra water to make a thin slurry. This counter-intuitive approach of first drying and then re-wetting takes advantage of a force of nature: completely dry clay that suddenly comes into contact with a lot of water will literally disintegrate and turn into slurry a process called 'slaking'; try watching what happens in a clear plastic cup to a small piece of dry clay when you add water. Conversely, moist clay will do virtually nothing for days while it sits at the bottom of a bucket of water.

Once the clay has slaked, swirl the slurry and allow the mixture to settle for a day or two. Then, either by pouring or scooping, retain just the top half to three quarters of the clay sediment that has settled at the bottom of the bucket. Organic matter will float to the top and can be skimmed off, while the bigger sandy particles will sink to the bottom and can be left behind. If you are careful, there will be no need to sieve the mixture, but if there is a great deal of waste material, it may be necessary.

CLAYS FOR SALE

Industrially produced clays are not often what consumers think they are. In order to achieve a high standard of uniformity with their clay bodies, manufacturers mostly mix their clays from a variety of sources, creating a chemistry in the body that will perform in a particular way. Manufacturers normally do not simply dig some clay out of the ground, clean out impurities, and sell it on. That would be too unpredictable a method, and they would not be able to say with any assurance that the clay would fire reliably to any particular temperature, have certain working properties, or have a reliable fired appearance.

In order to achieve a high level of uniformity manufacturers source the basic ingredients that go into a clay body from several different mines or pits. Often it will be one ingredient from one place, another from somewhere else, and so on. The colouring agents are usually added separately, too, so that colour can be carefully controlled. This also allows the manufacturer to start with a basic recipe and come up with a huge number of different clay bodies. Thereafter, the only difference between two clay bodies might be the amount of colouring agent added to them.

Clay bodies for sale are usually grouped by the temperature or 'cone' (see Chapter 4, p.71 for a description of this term) at which they mature.

Earthenware or terracotta:

low-temperature clays (also known as low-fire clay, see example, right) (cone 08–1).

Mid-range clays (cone 2–6)

Stoneware: middle to high-temperatures clays (also known as high-fire clay, see example, below) (cone 6–12)

right Cathy Kiffney, *Owl Tile*, 2009. 28 x 18 x 1.25cm (11 x 7 x ½ in.). Slab-press mould, red terracotta, decorated with coloured slips and glazes, fired to 1040°C (1900°F). *Photo by the artist.*

below Noah Riedel, *Large Bowl*, 2009. 7.5 x 20 x 20cm (3 x 8 x 8 in.). Thrown and altered stoneware clay, raw-glazed with porcelain slip decoration, single fired to cone 7 in oxidation. *Photo by Seth Tice-Lewis.*





- Earthenware and stoneware clay bodies come in a wide variety of colour choices (usually earth tones) and textures. The smoother clays are usually sold as clays to be used on the wheel ('throwing clays').
- Coarser clays (which are often just the smooth clays with grog added to them) are usually sold for large thrown or handbuilt pieces, but most clays can be used for a wide variety of projects despite the manufacturers' recommendations.



above Dennis Kilgallon, *Wave*, 2004. High-temperature stoneware clay, 59 x 59 x 25.5cm (23 x 23 x 10 in.). The initial model was made in styrofoam, from which a two-piece plaster mould was taken. The piece was then hand-pressed from the mould. When damp, the surface was decorated with sgraffito and incised lines. When dry, the surface was rubbed with a mixture of manganese dioxide and whiting. It was once-fired to cone 11. *Photo by the artist.*

left Susan Draughon, *Andrew Draughon*, 1997, 20 x 46cm (8 x 18 in.). This life-size bust was made from an oil clay called plastilina, and was then used to make a mould from which a bronze was cast. *Photo by Gerry Marketos.*

Other clay bodies include:

- Porcelain: usually a pure white, high-fire clay that is normally very smooth but can also be made coarse through the addition of molochite.
- Paper clays: clays with paper fibres added to increase strength when dry and to reduce the likelihood of cracking while drying.
- Self-hardening or air-hardening: clays that do not require firing to become impervious to water. NB: not recommended for use with food or drinks!
- Raku: clays well suited for the dramatic temperature changes associated with raku firing.
- Oil-based or plasticine: clays that are not fired but instead used to make a mould which is then cast in a foundry.

In many cases the raw ingredients that manufacturers use to make their moist clay bodies are for sale in their dry powdered form. A few artists work to develop their own specialised clay-body recipes, and some manufacturers will mix large batches of these recipes for a fee.



left Jo Bunbury, *Green and Copper Raku Conkers*, 2005, 9 x 8cm (3½ x 3in.). Handbuilt using pinch and coil techniques. *Photo by Martin Avery.*

below left Susan Draughon, *Whale Dreams*, 2006, 20 x 43cm (8 x 17in.). Handbuilt mask from stoneware paperclay, once fired and patinated with bronze patinas and sealed. *Photo by William A. Sosa.*

below right Jennifer Lawler-Mecca, *Amber Lidded Jar*, 2009, ht: 25.5cm (10in.). Thrown and altered, fired to cone 7 in oxidation, decorated with sprigs and cut lines inlaid with slip. *Photo by Randy McNeilly.*



CLAY-BODY CHEMISTRY

Why should anyone care about the chemistry of their clay? Doesn't studying the science behind the artwork take the fun out of it? Absolutely not! The fun comes from being able to do what you want with the material, and understanding the chemistry of clays will provide insight into how to solve problems when things go wrong, and will also open new doors of understanding that allow you to move in new directions. Read through the following sections and see if your clay doesn't take on a new life next time you work with it.

As has been discussed, the theoretical composition of clay is silicon dioxide (commonly referred to as either silica, quartz or flint), aluminium oxide (commonly referred to as alumina), and chemically bound water. This chemical formula for pure dry powdered clay is written as:



where Al_2O_3 is the formula for alumina, SiO_2 is the formula for silica, and H_2O is the formula for water.

Alumina has several special properties that make it very important to artists working in clay. First of all, by itself it has a very high melting point, more than 2000°C (3632°F). Generally, this material inhibits the melting of other materials at high temperatures. In its raw state it is a white powder, and it is unaffected by the temperatures reached in normal ceramic kilns. It is added to clay bodies as a component in clays, feldspars, certain frits and in its pure form.

Most people have seen **silica** crystals before, either in the form of inexpensive jewellery or, more likely, in the form of beach sand. Silica crystals are everywhere! They can be found in the rocks used on gravel roads and in rock outcroppings all over the world. Quartz



Some examples of quartz: in pebbles and in strips in a larger rock. *Photos by the author.*



Eck McCannless, *Blue Crystalline Pot*, 2008. Dia: 20cm (8in.). A pot glazed with a macro-crystalline glaze, fired to cone 10. *Photo by Misty Donathan.*

crystals often show up as white sparkles in grey or black rocks.

Typically, crystals form when liquid minerals are cooled slowly, especially in the absence of alumina, this can be seen in the photo above where large zinc crystals have formed in a macro-crystalline glaze. Silica has a high melting temperature of about 1650°C (3002°F); the partially melted silica in a clay body is what holds the piece together. In a clay body, silica is normally added through the clay used, but can also be added through feldspars, frits, talc and wollastonite, as well as in its pure form.

Water in its chemically bound form can be confusing for potters. The clays that ceramicists use have two kinds of water in them until they are fired: the chemically bound kind and the non-chemically bound or 'mechanical' kind. Chemically bound water is locked into the molecular makeup of clay and will not come out through drying. Yes, dry powdered clay contains water molecules, even though it is not wet! Mechanical water is the kind that we add to clay from the sink, or subtract through drying. The chemically-bound kind can only be removed through heating, and once removed the clay becomes a ceramic material and can no longer be re-softened.

Clay-body additives and colourants

Many different kinds of materials can be added to clay bodies to achieve various characteristics depending on the needs of the artist. Large, thick sculptures will require a clay body that shrinks less and allows for moisture to escape easily (see photo below).

Thin, uniform shapes can be made from clay bodies that shrink considerably. Generally, clay bodies shrink by between

5 and 20% from their initial wet state. Shrinking occurs at all stages: from wet to dry, during bisquing and during glaze firing. The amount of shrinkage will depend on the materials used in the clay body.

A simplified way of looking at this is to divide the materials commonly used in making clay bodies into those that reduce shrinkage and those that increase it. This is relatively easy. Clays, such as kaolins and ball clays, tend to be those materials in clay bodies that increase shrinkage, whereas the use of

grog, alumina, silica and feldspars will see shrinkage decrease.

There are two factors that cause an increasing or decreasing amount of shrinkage in materials. First, a large particle size in a given material will generally decrease the amount of shrinkage, while a fine particle size will tend to increase it. Second, some of the molecules change shape during firing. This shape change can result in either an increase or a decrease in size. Under normal circumstances, particles partially



left Alan Foxley, *White Form Two*, 2008. 89 x 48 x 23cm (35 x 19 x 9in.) Coil- and slab-built. Flattened areas decorated with manganese dioxide and black copper oxide; white areas decorated with a porcelain, feldspar and gum arabic slip. Once-fired to 1280°C (2336°F) in a gas-fired reduction kiln, then fired again (same temperature) following a wash of manganese and copper. *Photo by the artist.*

top Clay strips showing shrinkage at each stage of the process: wet clay, dry clay, bisque-fired clay, and after firing to stoneware temperatures.

bottom Examples of 'home made' clays with different colourants added. *Photos by Jennifer A. Siegel.*

melt and form closer bonds with each other, thereby causing an overall size decrease. However, some less common materials, such as kyanite, actually increase in size over much of the firing range for pottery.

Colouring your clay can add to its personality and help you create the effect you want. Many colourants used for glazes can be incorporated into clays; however, coming in contact with these colourants for extended periods can be very hazardous. With regard to contact with the skin, the following table (see right) lists colourants/variegating agents that can be added safely to a clay body.

To add a colourant to a clay body, simply measure out the amount you want to add, sprinkle this on a table top, and wedge the clay on top of it until it mixes in. You can also mix two different coloured clays together, either completely to create a mid tone, or incompletely to create a marbled effect. However, adding other colourants to a clay body should generally be avoided for health and safety reasons. Adding small amounts of stains and colourants to a light-coloured clay using gloves is considered safe when creating millefiore ware, for example, but extra precautions should be taken to ensure the clay does not dry out and become airborne, as metal toxicity can result from breathing the dust of many colourants.

CLAY STORAGE

Storing your clay for a few weeks or longer before using it can have its benefits. The growth of mould in the clay, as well as the complete wetting of the materials, will usually impart a greater degree of workability to a clay body

Clays that have been delivered in their wet state have probably already aged sufficiently, but if you are making your own clay bodies from dry materials, allow the wet mixture to stand for as

Material	Colour response in clay body	% by weight used in clay body
Iron oxide	Reds, browns, blacks	0–20
Crocus martis	Similar to iron oxide, but not as pure so will provide some variegation	0–10
Titanium dioxide	Depending on mesh size, will provide white specks or general whitening	0–5
Grog (fine, medium or coarse)	Depending on the grog, will provide specking of light or dark colours	0–25
Basalt	Black specks or darkening	0–5
Illmenite	Black specks or darkening	0–5
Rutile	Contains iron and titanium, so will create light and dark variegations, sometimes yellowish/gold hues	0–10

long as possible before use. Mould in clay provides an extra level of plasticity due to its inherent sticky properties. Some people add small amounts of corn starch, flour or bread to their clay body during mixing to provide food for the mould to really get it growing!



Clay with mould on it can be a good thing! Aged and mouldy clay can often exhibit heightened plasticity.

PARTICLE SIZE, SHAPE AND PLASTICITY

The tiniest particles, which make up the bulk of a clay body, are so small that several could fit inside a single bacterium! These tiny pieces are shaped like tiny flat plates and can only be seen using a strong microscope. An average-size grain of sand would be nearly one thousand times bigger than an average particle of clay!

Different clay bodies can have very different average particle sizes, depending on the materials they are made from. These differences in average particle size have a profound effect on the way clay bodies behave. Those bodies with too small an average are waxy and sticky and have very little strength when wet. Bodies with too large an average size tend to be crumbly and not hold together, no matter how much water we add. Those clay bodies with the greatest all-round use tend to have a mixture of particles: small ones to make the bigger ones stick together; bigger ones to keep the clay from being too sticky and give it some strength

Making a clay body

Clay bodies are fairly simple to make, and the process does not require precise computations. Any difficulty lies in the actual manipulation of the materials. If you do not have a clay mixer or a pug mill, making more than a few pounds at a time will prove to be very hard work, though it can be done. There are many ways to take the work out of the process, and most of these involve mixing the ingredients in as wet a form as possible, then drying them down until they are in a more usable form, then wedging them by hand or running the clay through a pug mill.

For a stoneware body, simply start with Table 3. Look at the suggested percentages and try a mixture. As the percentages are listed by weight, you will need a scale, but you can try doing it by volume as well and see what comes of it. Clay bodies are largely very forgiving, and nothing too terribly bad is likely to happen if the mixture is not made to exacting measurements. It does make sense to do a very small amount at first and test-fire it in a bowl of previously tested clay to protect your kiln shelf in case of melting. If at first your clay melts or bloats, add more refractory (meaning heat-resistant) ingredients (the first five materials listed are more refractory). If your clay remains too open and unvitrified, add some of the materials that will lower the melting temperature (any of the last six materials listed). Substitutions can be made for the ingredients listed (see the appendices for UK and US equivalents).

To make a low-fire earthenware body, add a greater percentage of any of the last six materials in the table.

To mix your clay body, first weigh out each ingredient and put them all together in a bucket. Mix the dry ingredients together well before adding water. Do not forget to add colourants if

Table 3: Materials used in stoneware clay bodies (cone 6 to 10)

Material	Normal percentages
Stoneware clay	40–90
Fire clay	0–30
Kaolin	0–40
Silica	0–20
Grog (usually fine)	0–20
Feldspar (potash or soda)	0–20
Ball clay	10–30
Earthenware clay (you can use your wild clay here)	0–50
Bentonite (adds plasticity)	0–5
Wollastonite	0–5
Talc	0–5

you wish (see Table 2, p.26) or some of your wild clay. If mixing a small amount, then add water bit by bit and start wedging the clay until it is well mixed. With larger amounts it is often best to add an excess of water to ensure that all the particles get completely wet, which can take several days. Use a stirring stick to work in the water, stirring it up until the clay mix is wet and mucky (forming a 'slurry' type of mixture). Then spread out the mixture and let it dry down to a usable consistency. This process can be sped up by spreading the clay on an absorbent surface, such as a plaster slab. Once it has dried to a workable consistency, wedge up the clay and give it a go!

when wet. As described earlier, particle size also influences shrinkage, so coming up with a clay body that will do all the things we need it to do can take some time. Experimenting with the basic ingredients can be an illuminating process. Try making your own clay body following the project described above.

SAFETY

One of the main hazards when working with clay is the dust produced by dry materials. Maintaining an atmosphere free of dust is important for the long-term respiratory health of all those working in the studio environment. Additionally, clay and ceramic materials are heavy! Use caution when lifting

heavy loads, and get help lifting things whenever possible. Wheeled carts and hand-trucks can be a great help in reducing these hazards. See the safety section of Chapter 3 and the appendix on studio safety and environmental health for additional safety information.

3

METHODS OF WORKING

GETTING STARTED

FIRING TEMPERATURES AND CONES

CLAY TOOLS: HAND TOOLS

STUDIO SET-UP AND EQUIPMENT

THROWING

LEARNING TO MAKE PIECES: CENTRING,
OPENING AND PULLING UP THE WALLS

THROWING A PLATE

TAKING A FINISHED PIECE OFF THE WHEEL

TURNING, TRIMMING AND FINISHING

ADDING TO YOUR THROWN WORK: MAKING
HANDLES

SPECIAL SHAPES ON THE WHEEL: LIDS AND
SPOUTS

ASSEMBLING A TEAPOT

DISABILITIES AND THROWING

HANDBUILDING

WORKING WITH SLABS

WORKING WITH COILS

THROWING AND ALTERING

CLAY RECYCLING

WEDGING CLAY

SAFETY



GETTING STARTED

Most people do not start working with clay on their own without first experimenting with it in a school setting of one sort or another. If you are interested in working with clay and have never before taken a class, it is highly recommended that you get a little ‘clay behind your ears’, literally and figuratively, before setting off on your own.

There are many choices to make when first working with clay. Ahead of you are a myriad of possible paths: types of clay, ways of making things, ways of firing things, different glazes and decorating methods, and so on and so on. Many choices are dictated by available resources, space, money and time. Most experienced clay artists would recommend that you start off small and work toward your own methods and habits, purchasing additional equipment and tools as needed. By proceeding cautiously like this, you will avoid wasting resources.

Most people associate clay work with a potter’s wheel, a kiln and a clay studio. Often there are glazes and lots of hand tools, and sometimes bigger electric machines for manipulating the clay. There is a funny thing about clay and the people who work with it: some people recognise straightaway that they are working with mud – a crude, common, dirty, messy and often free material. Other people see clay as a highly technical material that can be shaped and hardened with computer-assisted machines.

For the first group, the clay is often shaped by hand, work is done outside, and the clean-up is left to natural processes. Clay sculptures are sometimes ‘finished’ when they are dry, and firing the work is not always necessary (however, sculptors working in this way are few and far between). People in the second group tend to think in terms of the chemical makeup of clay and have books about



A group of students discussing glazes suitable for their clay. Photos by Jennifer A. Siegel.

physics in their studios; their kilns are controlled by computers, and the periodic table of elements is on the wall of the glazing area. Some of those in this group manage to leave the studio at the end of the day cleaner than when they arrived. People’s personalities tend to dictate what sort of relationship develops between them and clay; and luckily, clay is well suited to both mud-wrestlers and neat-freaks. The vast majority of people that work with clay, whether by sculpting, handbuilding, or throwing, fall in between these extremes. Very few artists refrain from firing their finished pieces, and very few as well think in terms of the atomic structure of their dishware.

No one can master all the different techniques, and most people would not want to try. It is, however, advantageous early on to become aware of as many different techniques as possible, and to begin to make decisions as to which method of working most appeals to you. Once you have identified a direction that suits you, develop as deep an understanding of the techniques involved as

possible. Some people remain clay students for life, taking new classes each year and trying out new techniques. This habit can be endlessly rewarding, but if your goal is to become proficient and marketable, then focusing on a few techniques over many years usually proves to be the most rewarding approach.

Choosing your clay body

The first choice to make when working with clay is to choose the clay body you will work with. A clay body is composed of several different kinds of raw clay, plus other ingredients to make it look and feel a certain way (see p.20). Your chosen clay body will need to be able to withstand your methods of working (e.g. not be too hard or too soft), look good to you when fired, and fire to the correct cone. (For now, ‘cone’ can be thought of as interchangeable with ‘temperature’. Cones and temperature will be discussed more fully in Chapter 4).

If your goal is to handbuild – which means making things away from the

potter's wheel – then you will often need a clay body with a somewhat grittier feel, especially if you are planning to build bigger and thicker pieces. Wheel-throwers frequently find that smoother clays are easier on their hands, especially when first learning to centre. Most existing studios will have clays designated for the wheel or for handbuilding, and most manufacturers can recommend clay bodies that will have the right 'feel' for your purpose. As discussed in Chapter 2, the particle size in the clay you choose will dictate both the way the clay feels and how much it will shrink. Wheel-throwers can normally get away with using smoother clay bodies with smaller particles and a higher shrinkage; handbuilders using the same clay bodies run the risk of cracks developing in the work.

The colour of the clay really comes down to personal choice. Most teaching studios will only have a few choices in this regard. You will probably be glazing your pieces later, so the colour might not really matter that much as the clay will mostly be covered anyway. However, the colour response of the glazes over light-coloured clay bodies will be quite different than over dark ones. If you are looking for bright glaze colours, choose a light-coloured clay body; if you desire more muted tones, go for a darker one.

In an existing studio the firing temperatures of the kilns and the maturing temperatures of the clays in use will have been coordinated. Most manufacturers and studios describe their pre-mixed wet clays in general terms by the cone (again, think temperature for now) at which they mature.

So, which clay to choose? If you are new to making things with clay, especially if you are planning to use the wheel, choose an inexpensive clay because there is a lot of wastage at the



Penelope Withers, *Two Freeform Bottles*, 2007, ht: 50 and 51cm (19½ and 20in.). Fired to 1280°C (2336°F) in an electric kiln. Photo by Ken Fisher.

start. Many teaching facilities will have a clay recycling programme that you can take advantage of. If not, start one! (see p.64 for advice on recycling). Frequently there will be free clay for you to use if you are willing to help with the recycling process. If attending a class, take the teacher's advice as they will have a good idea as to what clay will best suit your experience level and goals. If you are working on your own your choice will be harder. The most important aspect will be to make sure the clay you choose will not melt at the cone you plan to fire to. So, what cone should you fire to? Read on!

Firing temperatures and cones

People fire clay to many different temperatures, with a huge variety of results. Very low firing temperatures, which for clay means anything below about 350°C (662°F), will have no effect on the clay other than to make it hot. Above 350°C (662°F), the chemically bound water (see Chapter 2) will start to be driven off. Once this process has been completed, the clay will no longer be affected by becoming wet, meaning it is no longer clay but is now a ceramic material that will not disintegrate in water. Most people firing pots in modern kilns think about firing their pots somewhere in the range between 900°C (1652°F) and 1300°C (2372°F). Low-fire (earthenware) clays tend to mature – but not melt – in the range between 900 and 1050°C (1652 and 1922°F); mid-range clays mature from about 1050 to 1200°C (1922 to 2192°F); and high-fire clays (including porcelain) mature between 1200 and 1300°C (2192 and 2372°F) – see also pp.21–3 for photos of fired clays. Some considerations to bear in mind when choosing what temperature you will fire to:



Victoria Christen, *Pink Watering Pot*, 2005, 15 x 7.5 x 12.5cm (6 x 3 x 5in). Red earthenware with coloured clay slips, thrown and altered, fired to cone 04. Photo by Courtney Frisse.

- How high can your kiln fire? Some kilns are not powerful enough to fire above a certain temperature.
- How long do you want your firings to last? Higher temperatures generally take longer to reach.
- How about cost? It is more expensive to heat kilns to higher temperatures.

However, many low-temperature glazes are more expensive than high-temperature glazes, partially offsetting the increase in firing cost.

- What sort of effects do you want to achieve? This last consideration is a complicated area and therefore hard to summarise succinctly. Very generally, after firing, high-fire pottery tends to feel more durable and look a bit more

like stone (hence the common name ‘stoneware’), but an awful lot of the same effects can be achieved at lower temperatures as well. Low-fire or earthenware clay is usually porous (after firing) and can feel like the terracotta clay used to make traditional flowerpots. High-fire glazes tend to have more subdued colours with a narrower palate of colours to choose from, while lower-temperature glazes and decorations are often brighter and utilise many different colours.

To keep things simple, for now we will focus on the three most common cones people fire to: 04, 6 and 10 (see p.70–71 and the cone table on p.154). Those who fire to earthenware temperatures often fire to cone 04, or about 1050°C (1922°F). Those who fire to mid-range temperatures usually fire to cone 6, or about 1180°C (2156°F), and those that fire to high-fire temperatures usually fire to cone 10, or about 1260°C (2300°F). You will tend to find a lot of information available for these particular cones, especially with regard to glaze recipes, and far less for other cones.

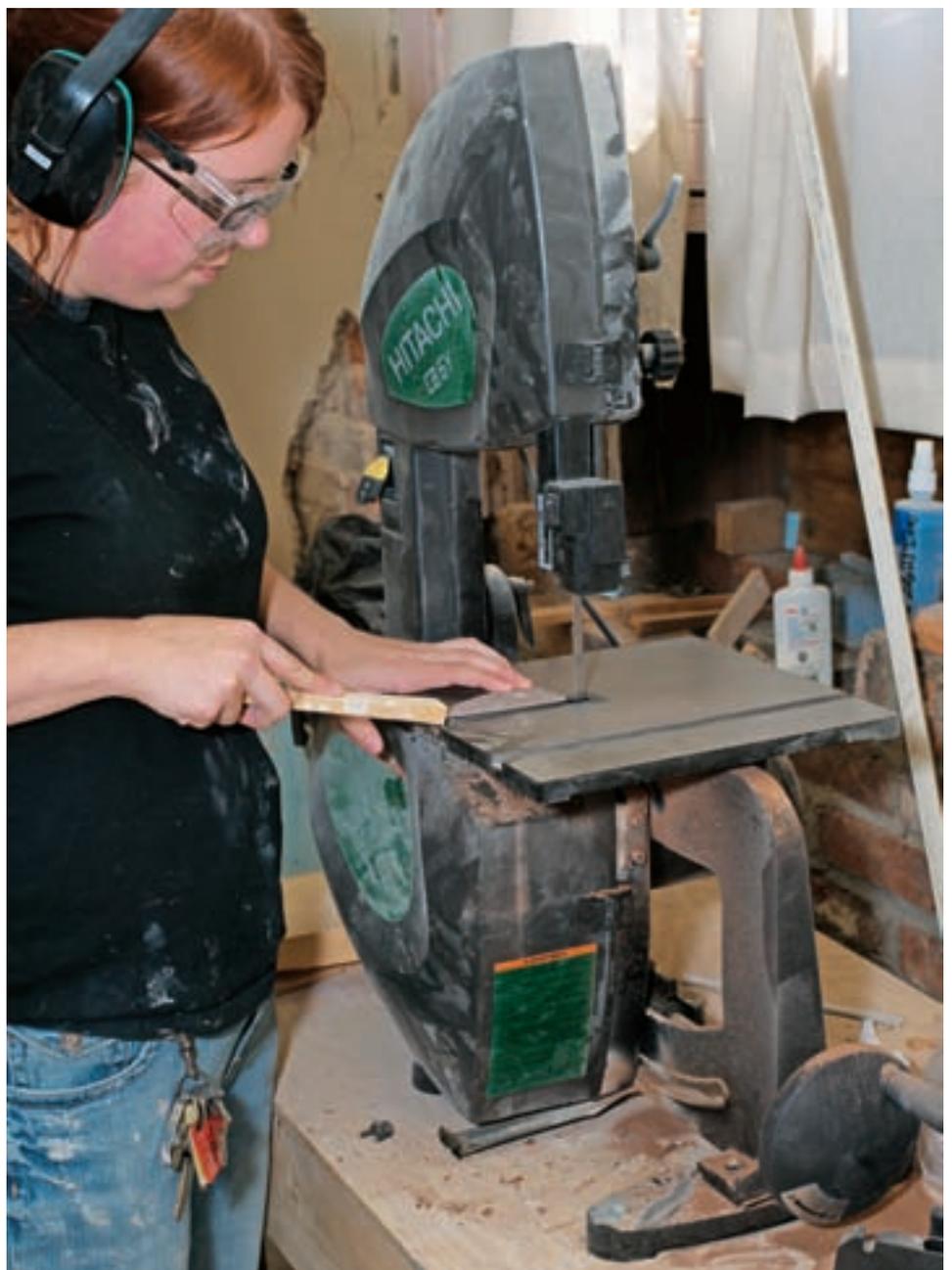
For those just setting out, one way to get started initially is simply to find a piece of finished pottery that you like, then try and determine what cone it was fired to. Make that your starting point. If you have seen some stoneware bowls that excite you made from buff-coloured clay, then purchase some high-fire buff stoneware clay (and make sure you can fire to sufficiently high temperatures in the kiln you will be using). If you are drawn to some brightly coloured tiles that are made from earthenware clay, purchase some low-fire clay. It is best, of course, to go into the making process with the right materials, so spending a little time at first thinking about what it is you hope to achieve and acquiring the materials that will allow you to do this will be time well spent.

CLAY TOOLS: HAND TOOLS

Clearly, the tools you will need will depend on how you will be working with the clay. Sculptors and handbuilders will need a different array of tools than people working on the wheel. Some artists prefer to make their own tools, which helps to personalise their work. If you want your pieces to be as individual as possible, then starting with handmade tools is an important first step.

It is faster to just buy readymade tools, but consider at least making a few tools yourself; they can be as simple as a whittled stick or a shaped piece of plastic (such as a cut-up old credit card).

Here are some recommendations for tools needed for working with clay in specific ways, listed in order of how commonly they are used.



Having access to woodworking machines can allow you to make a wide variety of your own clay tools.

Throwing

Essentials

- Sponge
- Needle tool/pin tool
- Wooden knife*
- Wooden ribs*
- Wire-cutting tool*
- Rubber/plastic ribs (old CDs and cut-up credit cards work well)*
- Loop tools for trimming/turning*
- Paintbrush*
- Old towel/cloth
- Water bucket/container

Useful items

- Wooden bats*
- Callipers*
- Bisqued trimming chucks*
- Foot (the base of a pot) shaping wood profile tool*
- Metal fluting tools*
- Metal scraper
- Wood profile tools*
- Rim-shaping wood tool*
- Wooden jigs (for mugs, bowls, vases, crocks or canisters)*
- Wooden paddle*
- Wooden pot lifters or cradles*
- Wooden throwing stick*

Handbuilding/Sculpting

- Ruler/straight edge
- Canvas-covered work boards*
- Fettling knife
- Loop tools *
- Modelling wood tools*
- Rolling pin*
- Rubber ribs
- Sponge
- Wire-cutting tool*
- Wooden ribs*
- Hand extruder
- Plaster slump or hump moulds*
- Sculpting stands/broadwheel
- Wooden paddle*
- Spray bottle (to keep work damp)



An * next to a tool indicates those that can be made at home using simple tools.

top An array of clay tools made at home using woodworking equipment.
middle Tools used when throwing on the wheel.
above Some tools used for handbuilding.



May Criado, *Disco*, 2007, 42 x 11 x 45cm (16½ x 4¼ x 17¾in.). Stoneware and porcelain assembled slabs. Fired to 1250°C (2282°F). Photo by Xose Abad.

Tilemaking

Ruler/straight edge
 Canvas-covered work boards*
 Rolling pin*
 Rubber ribs
 Sponge
 Wooden modelling tools*
 Wooden ribs*
 Miniature rolling pins with
 imprinting designs*
 Press moulds, plaster*
 Slip-trail bottle
 Tile cutters

An * next to a tool indicates those that can be most easily made at home using simple tools.



Speciality tile cutters for those making lots of clay tiles of a specific shape.

STUDIO SET-UP AND EQUIPMENT

Setting up a complete studio is a big job no matter how you look at it. Having a large dedicated space in which to make things with clay is optimal in one sense in that the mess created by the clay is kept away from other activities, but making things from clay in small multipurpose spaces is common practice. Simply sitting out in the garden or at the kitchen counter with a board and some clay can be space enough for many projects. Finding a space for a wheel and kiln can be a bit trickier. Small wheels are made now that can fit in closets and under counters, and small kilns can be located outside next to a garage or patio under a metal shed roof if need be. Pottery can be and always has been created in the most primitive of situations, so don't be put off if you don't have a room to dedicate to your craft. Remember, however, that many of the chemicals used in making

ceramics are hazardous: keep them away from food and food preparation areas and out of reach of children. Be sure also to wipe surfaces down afterwards to eliminate clay dust.

Most people working with clay have as a minimum the following requirements for a 'studio' set-up:

- A table to work on
- Access to water
- Some hand tools
- Shelves for storing work/materials
- Buckets for storing materials/scrap clay/glazes
- A kiln or access to a kiln/firing method
- A scale for weighing clay/glaze ingredients
- A sieve for glazes

People choosing to make round pots will often need a wheel, but round pots can

also be made by coiling. In addition, it is convenient to have a small sturdy table specifically for wedging your clay – one that is made of plaster and can therefore also be used to dry out very wet clay is extremely handy. Wedging tables often have a wire strung over them for quick cutting to assist the wedging/de-airing process. More information on wedging can be found later in this chapter.

Other pieces of equipment that can be purchased and used but are by no means essential for making things with clay are:

- A pug mill
- A wall-mounted extruder
- A clay mixer
- A spray booth
- A slab roller



The de-airing pugmill is used to blend soft clays together and remove trapped air bubbles, effectively wedging the clay for you. The output end of the machine can also be used as a horizontal power extruder.



left A wall-mounted extruder can be used to quickly make a variety of shapes, much like a larger version of a child's play-dough machine.



above A clay mixer is not normally found in a home studio — they lend themselves to larger facilities for mixing or recycling large amounts of clay on a regular basis.



top A spray booth takes up a lot of space, but allows artists to apply glazes to awkward and heavy pieces. *Photo by Jennifer A. Siegel.*

above A slab roller is nice if working extensively with large slabs, but often a rolling pin will do the job more quickly. *Photo by Cathy Kiffney.*

These larger pieces of equipment tend to be cost-prohibitive for most people and are generally unnecessary for people beginning with clay. As you develop your skills and style, purchasing a larger piece of equipment will be of great help in producing work on a larger scale.

THROWING

Once you have chosen your clay body, perhaps purchased some equipment and found a place to set it up, it is time to start making things! Truly, the best way to learn to make pieces on the wheel is to take a class and have a teacher with experience show you how to position your hands and body with the equipment you are using so as to give you the best chance of success.

If this is your first go at attempting work on the wheel, then the following motto should never be far from your mind: Give yourself the chance to be a beginner!

People often give up making pottery only because they expect 'good' results too soon. Be patient and give yourself time to develop your skills.



above Electric wheels come in many shapes and sizes. Find one that works for you ergonomically and fits in the space available to you. *Photo by Jennifer A. Siegel.*

below A kick wheel. *Photo by Noah Riedel.*





Mark Hewitt, *Teapot*, 2007, ht: 12.5cm (5 in.). Thrown and assembled teapot, wood-fired and salt-glazed. *Photo by Jason Dowdle.*

Learning to make pieces: Centring, opening and pulling up the walls

For most people it is not how much time they spend on the wheel practising throwing that will have the biggest

impact on their skill development (although without regular practice the basic skills will never be learned). More important than the total time spent at the wheel is the number of times you

‘start over’ with centring and, as an offshoot of that, how much clay you have attempted to centre.

Most people can usually centre 0.5–1kg (1–2lbs) of clay reliably and easily after having attempted a total of about 450kg (1000lbs), 1–2lbs at a time. Although this may sound like a lot, each attempt will only require a few minutes – usually before something goes wrong! Spending lots of time on the wheel practising the wrong thing, i.e. practising attempting to save a piece that has gone ‘wrong’, is not time well spent! A hundred hours spent learning how to centre and develop a simple form properly will require starting over about every 5 minutes, at the end of which you will indeed have practised with more than 450kg (1000lbs) of clay. A hundred hours spent trying to save failing pieces will not teach you what you need to learn, and you will also spend far more than 5 minutes on each attempt.



Opening up the clay to create a base for a pot.



Pulling up the walls of a vessel.

Here are 20 steps for throwing an upright shape on the wheel (flat, plate-like shapes will be discussed in the next section).

For beginners, your very first project is to just centre the clay and not worry about whether or not it turns into anything. Centring clay is a process of evenly distributing the clay you are using in the middle of the wheel, so that it looks nice and round and smooth, sits centrally on the wheelhead in a contained lump, and doesn't wobble when the wheel is turning.

Step 1. First, accurately weigh out the correct amount of clay for what you plan to make (1).

Experienced potters will know about how much clay to use for their project. For beginners, the very best thing you can do to make your life easier when first working on the wheel is to simply start with the same small amount of clay each time. Be sure to have a scale for weighing clay, and measure out several 0.7 kg (1.5lb) balls of clay at the beginning of each session. Using the same amount of clay each time will give you the chance to practise the same moves in the same way each time, and this will allow for the most rapid development of your skills.

Step 2. Wedge your clay into a ball (2B) (more information about wedging clay can be found later in this chapter) and plop it (this is where the term 'throwing' comes from, but it's really more of a 'plop' or a slap) down onto the centre of a wheelhead that is dry and clean, assuming it's your first piece of the day (2A). If you've already been working, then plop it onto the thin clay circle left behind by your previous piece/attempt after you cut it off with a wire tool. Patting it into a rough cone shape first can also help the process (2C).

A common problem at first is that the clay refuses to stick and keeps coming off the wheel. This can be very frustrating. If any water gets between your clay



Weighing the clay on a scale prior to throwing.



Once your clay is prepared, slap the ball of prepared clay onto the wheelhead as near the centre as you can.

and the wheelhead, the clay will come off when you push on it to get it centred. If this happens, remove the clay and dry the wheel with a towel, then dry your clay and start again. Each time you cut a piece off the wheel with the wire tool, leave the remaining clay, a thin circle, on the wheel and place your next piece on this circle; it will stick well.

Step 3. Squish down the edges of the clay to seal it to the wheelhead (3). It's not much of a technical term, but squishing the clay is an important step. Press the edges down to the wheelhead to keep water from getting underneath.

Step 4. Use your sponge with the wheel turning to further seal the clay to the wheelhead (4).

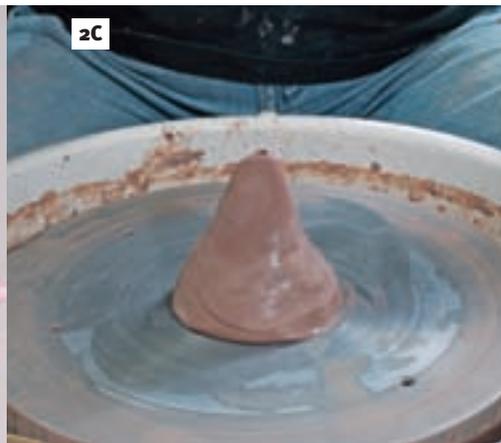
Step 5. Finally, it is time to add water! Water is both your friend and your enemy when throwing. It keeps the clay slippery, but over time it also weakens the clay. As a beginner, do not worry about how much water you are using. Keep your hands wet and keep the clay wet and slick – this will help with centring. As you improve, centring will take less time and ultimately you will use much less water (5).

Step 6. Keeping your hands together, with the wheel spinning anticlockwise, push down your 0.7kg (1.5lb) ball or cone of clay until it is about 5cm (2in.) thick. Apply more water when it loses its slipperiness.

Look at the images and practise holding your hands as shown. It is very important that you keep your hands together. Do not push the clay down too far or you will not be able to push it back up again. If it does get flattened, just use your wire to remove it and start again (6).



Wedging clay in preparation for throwing.



Plopping the clay on the wheel firmly helps to get it to stick.



Squish around the edges of the clay before applying water to help get it to stick.



Use your sponge to completely seal edge of clay to wheel before adding water.



With wet hands, begin by pushing down on the top of the clay. This begins the centring process and helps further attach the clay to the wheel.



An example of clay that has been pushed down too far. If this happens, it's best to remove it and start again.

Step 7. Keeping your hands together, push the clay from the side until it ‘cones’ (not to be confused with the term ‘cone’ that has to do with the firing temperature in a kiln! In this case, it’s just referring to the shape of the clay) back up and is about 10cm (4in.) tall (if you are using 1.5lb/0.7kg of clay) **(7A)**. Apply more water when it loses its slipperiness. If you are sitting at an electric wheel, be sure to rest your left elbow on your left knee when you do this move **(7B)**. Use props under your foot if you need to raise your elbow. If standing or using a kick wheel, brace your left arm against your side as best as you can. The clay will want to push you around, but be as firm and as steady as possible.

Step 8. Repeat steps 5 and 7 until the clay is centred (which is easier said than done!) Your last move should be the downward motion (see image 9), before you move on to opening up the clay (step 10). Getting your clay centred consistently will take many, many attempts. Sometimes, the clay might just come off in your hands or fly off the wheel. This is perfectly OK and is bound to happen. Just use your wire to remove the rest of the clay from the wheel, remove the clay slime from your hands using the edge of your scrap bucket, then get a new ball of clay and start again. Starting again is important! Start again often, and don’t waste your time attempting to fix a lump of clay that has become too wobbly.

Above all, remember to have fun and don’t be worried if things don’t go to plan. Again, the best thing you can do to learn how to centre is to repeatedly start over, practising the initial moves until you get them right. If the clay gets too crazy or floppy, drop it in the recycling bucket and get a new piece (what to do with that bucket full of scraps will be discussed later under Clay recycling, see p.64).



7A After pushing the clay down, use your hands together to cone the clay back up again.

7B Good body position can make all the difference when centring. Be sure to keep your left elbow on your leg (alternatively, you can use the splash guard if your wheel has one). Boosting your foot up on blocks can help.



If your clay gets just too far off centre to continue, then it’s time to start again!



Opening the clay using thumbs.

Step 9. Deciding when the clay is centred enough to continue can be tricky **(9)**. Perfectly centring a piece of clay is physically impossible – it will never be absolutely perfect. On the other hand, as the wheel is spinning, if there is a noticeable wobble then you should continue trying to centre it. If while the wheel is turning you don’t feel the clay pushing you back and forth when you apply light pressure, then it is probably good enough. If you are unsure, try holding the clay with both hands and shutting your eyes – you will soon feel any wobbles. You have to be somewhat forgiving at first, but equally you won’t be able to develop an even, round form if you are overly forgiving. After centring the clay, follow the next steps.



An example of well-centred clay ready to open up.



Opening the clay using the index finger.



Opening the clay using thumbs.



Opening the clay further with thumbs.



If you pull outwards too far at this stage, the top ring of clay will come off the base. Time to start over.

Step 10. Once centred, the next thing to do is open up the clay. Before proceeding, make sure your clay has a flattened top. Keeping your hands together and keeping your arms well braced use your index finger or middle finger very slowly and carefully to push down just to the right of dead centre on your clay (10).

With the wheel turning, push slowly downward until you are about 1cm (1/2in.) from the wheelhead. Measure this using your needle tool: push the needle tool through the clay near the middle, slide a fingertip down the side of the needle to the top of the clay, and pull the needle tool out. The distance from your fingertip to the tip of the needle tool will give you

a good idea of how much clay is there. If it is too thick, keep going as before and measure again; if too thin, you can push a little ball of clay down into the hole and blend it in with a sponge.

Step 11. Widen the hole you have made by pulling the clay towards you while the wheel is turning using two fingers. Keep your hands together and brace your arms on your body. Alternatively, you can use your thumbs to pull out to the sides. Either way, do not pull too far and ensure you pull slowly and evenly (11A–C).

This is often where a doughnut-shaped ring of clay accidentally comes off (11D). To avoid this, stop opening

the hole before the fledgling clay wall that is forming begins to lean outwards.

Step 12. With the wheel turning, gently smooth everything out with your sponge and remove any standing water in the centre. This is a good time to compact the clay in the bottom centre of your piece. Use a sponge or rib to push down lightly in the centre, and work from the centre out and then back in. This will help to prevent the dreaded 'S' crack that can form in the bottom of pieces as they dry. Before proceeding, make sure the short walls that you now have are the same thickness from top to bottom. If not, smooth them with a sponge until they are. Pulling up uneven walls is very, very tricky, and not a skill you should have to develop.

Step 13. Preparing to pull up the walls. This step is the most dramatic and fun to watch, but its success is predicated on all the preceding steps having gone according to plan. Pulling up the walls is not very hard if you start with an even, well-centred piece. Again, starting over when things go wrong will help you get better at the early steps, which are fundamental to making a successful piece. Before you begin to pull the walls up, even out any bumps in the thick ring of clay at the bottom. Try to make sure it is an even thickness all round (13A and 13B).

To pull up the walls, follow these steps:

Step 14. First moisten the clay with your sponge, but try not to fill up the middle with water. Make your two hands into a claw shape (14). Keep hands together and keep your elbows braced on your torso throughout the move.



top Before continuing to develop the shape, smooth out any uneven parts of the low stumpy walls. This will make pulling them upwards a great deal easier.

above Smoothed and ready to go.



Lyn Morrow, *Covered Jar*, 2008, 46 x 28cm (18 x 11in.). Copper microcrystalline glaze on porcelain, fired to cone 11. From the collection of Bruce Foster. Photo by Catherine Whitten.

Step 15. With the wheel spinning, using your index fingers, push into the walls on the inside and outside of the piece – your right hand will be on the outside of the piece and your left hand will be on the inside with the clay moving away from you (wheel spinning anticlockwise). Try to keep your other fingers out of the way (**15A and 15B**).

Step 16. With the wheel still spinning at a medium speed, slowly and carefully draw your hands and fingers upwards. The relationship between wheel speed and hand movement is critical, and hard to get exactly right at first. Also difficult to get right is the amount of pressure to apply with your fingers. There should be enough pressure exerted through the clay between your right index finger on the outside and your left index finger on the inside to produce a thinner, taller wall when you pull upwards. Your upward pull should also be slow enough that all points of the clay wall are touched by your fingers as you move upwards. In other words, there should

be a continuous spiral up the sides (inside and outside). When the pull is complete, there should be a series of little lines up the side that are very close together (**16A**). As you improve, these lines will become more spread out.

If you find that, after you have pulled up, the walls have not become at least a little taller, you need to apply more pressure. Alternatively, if you have gone through the wall and a clay ring has come off in your hands, then you need to back off a bit on the pressure with your next piece of clay (**16B**).



This is a good hand position when learning to pull up the walls of a pot. Keeping your hands together will minimize wobbles.



Here is how it should look as you apply pressure at the base of the walls and begin to pull up.



Pulling the walls up. You can see the bulk of the clay as a ring being pulled to the top.



The lines on the sides of your clay after each pull can give you a visual description of the relationship between the speed of your wheel and the speed of your hand movements.



When pulling up, if you squeeze the clay too hard, it will wobble and tear. Time to start again.

Step 17. Repeat Step 16 several times until the wall is tall enough and thin enough. Before each pull, drip some water on the top of the wall so that it runs down both the inside and the outside. Each time you pull up, your cylinder should get a bit taller. Raising the cylinder by 1.5cm (1in.) each pull means things are going well: you are applying the right amount of pressure and maximising your progress. Many people aim to be able to pull the clay up until it is very thin (17), but the thinner the clay is the more likely the pot is to collapse, so you may want to start off with thicker walls until you improve. Other people like to keep things a bit thicker, even after their skills develop,

for any number of good reasons – for instance, they like the way a good sturdy piece feels.

Step 18. Making a finished shape out of a cylinder is the final step in making pieces on the wheel. Nearly all shapes except flat, plate-like shapes can be made from cylinders (18A).

To make a bowl, pull up a cylinder that is quite thick, and then use a hand on the inside (often with the help of a sponge or rib) to spread the cylinder outwards (18B, 18C, 18D and 18E).

To make a curved pot, throw a taller cylinder and push the middle part outwards from the inside; it can help to

leave a bit of extra clay in the parts of the cylinder you plan to push out (19). It is also possible to ‘collar’ the neck on some pots to make a more dramatic shape (19A, 19B and 19C).

Play around with these techniques and see what assortment of shapes you can come up with.

Keep an eye on how high you can pull your cylinders, how straight and narrow you can keep them, and how much time it takes for you to complete them from the time you first add water to the time you finish your last upward pull. You will find with practice that the amount of time required will decrease dramatically, and this will also greatly improve the



A nice straight cylinder made from about 1kg (2.2lb) of clay.



A short cylinder ready to be made into a bowl.



Beginning to shape a cylinder into a bowl using a rib. One of the curved sides of the rib is held against the inside wall.



Carefully applying pressure to the inside of a cylinder to form a belly. Help can be given by the other hand supporting the wall on the outside.



Collaring a cylinder to make the form narrower.

quality of the finished work for one simple reason: the faster you work, the less time the clay has to absorb water and become floppy. You might think that starting with dryer clay would be a good idea – and it is, to a point – but dry clay is very hard to centre. Wet clay is somewhat easier to centre, but hard to make stand up in any shape. You have to find a happy medium, and take advantage of the clay's softness and strength at different points in the development of your piece.



right Noah Riedel, small mug, 2008, 7.5 x 10 x 10cm (3 x 4 x 4in). Stoneware, chun glaze, once-fired to cone 7 in oxidation. *Photo by Seth Tice-Lewis.*



18C Continuing to shape a cylinder into a bowl using a rib.



18D The bowl after shaping with the rib.



18E A cut-through of the bowl shows even walls, and enough clay at the base to trim a foot later.



19B As collaring progresses the neck gets gradually more narrow.



19C Smoothing out the top rim having collared in the neck.