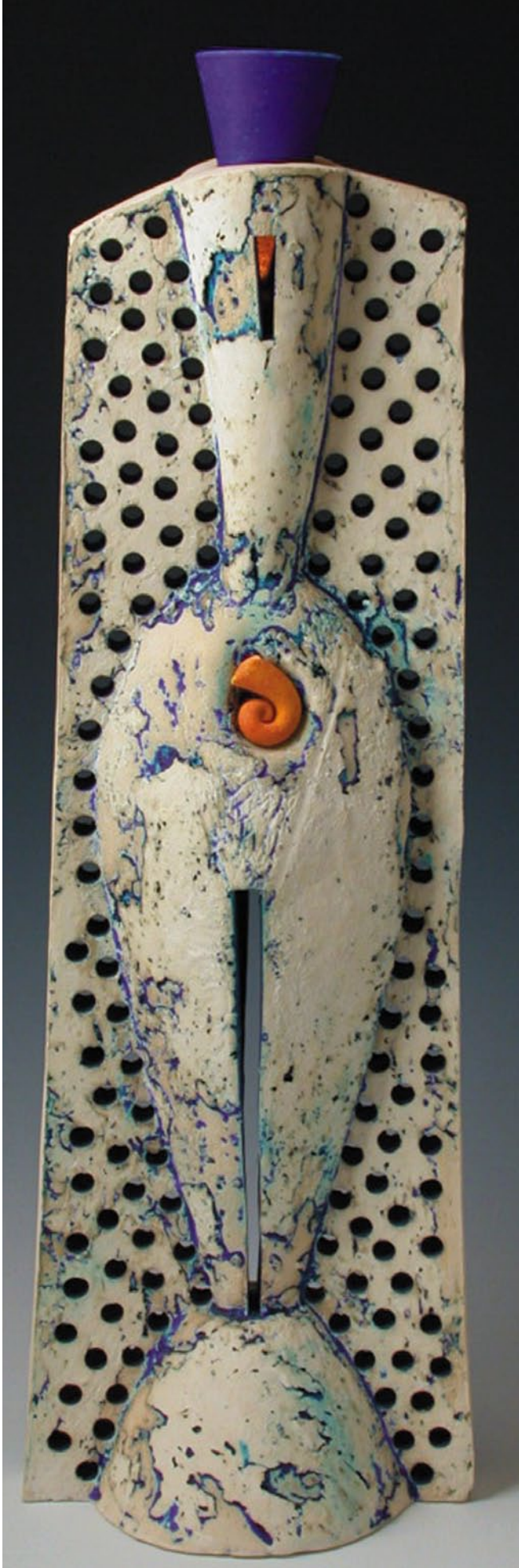
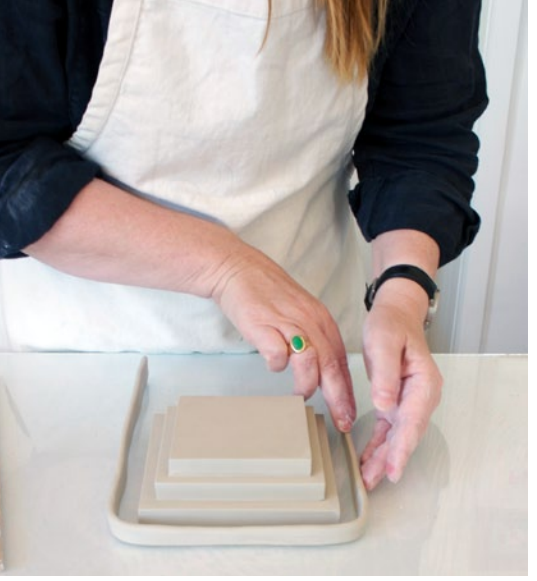
Paperplaster

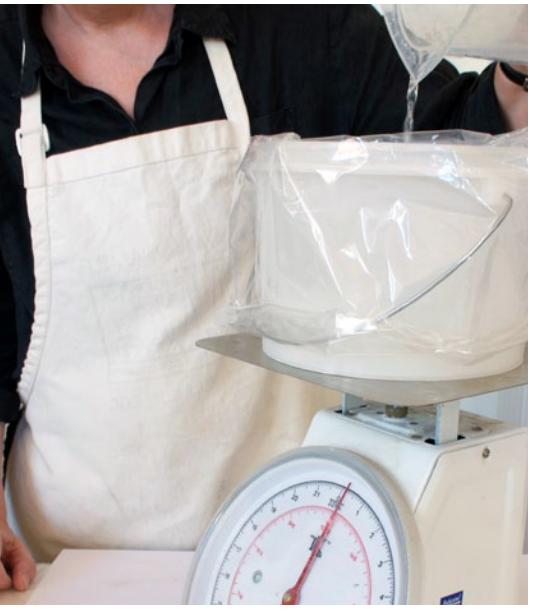
Trudy Golley describes her direct approach to lightweight mould-making for the studio artist

In 1994, I was invited by Red Deer College in Alberta, Canada to participate in an artists' residency in the ceramics studio. I had already decided that I would explore the process called 'paperclay' that I had read about in both *Ceramics Monthly* and *Pottery in Australia*. I had been scaling up my slab and coil-built work and was looking for a means to reduce shrinkage and cracking, which was what the various articles on cellulose-reinforced clay had promised. I went to the residency open to what might present itself as the result of experimenting with this new, to me, process.

At the residency I met Canadian ceramic artist, Ruth Chambers and Australian, Gundrun Klix. Ruth was making large unfired clay vessels (71 in/180 cm/h) and Gundrun was making large ceramic boat forms (35 in/90 cm/l). When I arrived, Ruth was busily mixing large amounts of clay into which she was adding about 30 percent cellulose fibre insulation by volume. My preliminary explorations with adding paper to clay were to mix torn up newspaper with hot water, let it sit overnight, and then blunge it into a pulp using a hand drill and glaze mixer. The fibre was then strained and added to a clay slurry, spread out on plaster bats and dried to a wedgeable state. This was labour intensive, and I had already observed that Ruth was short-cutting the process by adding dry cellulose insulation directly to a wet mixture of clay and blending it to the correct consistency.







Previous page: ***Karyatid.*** *1999. Mid-range stoneware. 57 x 17.5 x 13.75 cm/d*
Top: ***Figure 1.***
Above: ***Figure 2.***

I began to experiment with adding cellulose insulation in varying percentages to a slurry of the clay body that I was using and drying it on bats. This process was a bit faster and resulted in some useful technical information. I decided that the cellulose insulation was too inconsistent for fired ceramic pieces, as it was contaminated with bits of plastic, staples, *et cetera* and I turned to toilet paper as a source of the cellulose fibre.

Gudrun had been making large moulds for her ceramic boat forms and was using the method of waiting until the plaster was just starting to set before building up a surface over her model so that the mould would not be too thick and heavy. She observed Ruth and I using the cellulose insulation and asked the question that started my research into Paperplaster; "I wonder if it would work if we put some of the cellulose insulation into the plaster to make a mould." We worked together to mix up a batch of plaster, added the cellulose to a workable consistency and spread it over a model that Gudrun had at hand. It worked beautifully. Gudrun had a light, strong mould to work with and she commenced to press mould her boat forms for the *Goddesses Exhibition* (*Ceramics: Art and Perception*, Issue No. 20, 1995, Pg. 86.).

I was captivated by the possibilities. I have always had a love/hate relationship with moulds and mould making, loved using the moulds and hated making them. I also had some issues with using large scale, heavy moulds as I had hurt my shoulder in graduate school while trying to turn over a big press mould full of clay. I thought that there had to be a better way. I took the initial test that Gudrun and I had done and ran with it. I had many questions. Could one successfully slipcast using moulds made with this process; how durable would the moulds be; how long would they last; would they get mouldy; would the fibre affect the absorbency positively or negatively? Fourteen years on and innumerable Paperplaster moulds later, I can say that I have answered these questions. I have shared the process with others and, as a result, information has come back to me about perceived problems and useful innovations.

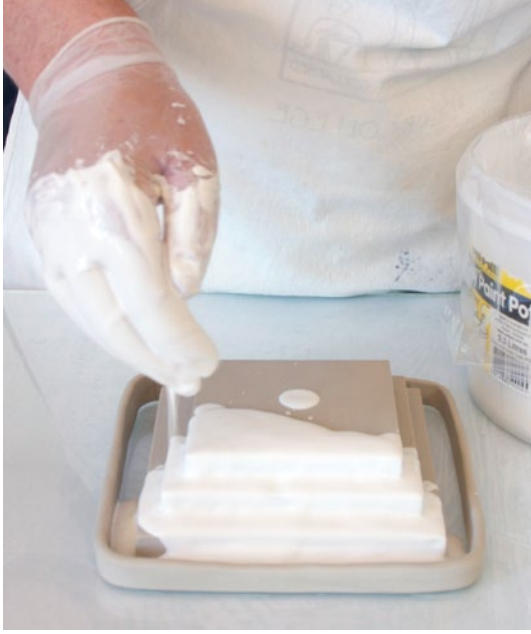
Using Paperplaster has revolutionized my approach to making and using moulds. I don't hesitate about making a model and casting a mould, whereas with conventional mould-making I would have asked myself how badly I really wanted that mould. The process is low-tech, and can be done in one's studio without the need for a dedicated plaster area. Setting up a model with wooden cottles and mixing large amounts of plaster was always a big commitment in terms of both time and materials – and then there was always the spectre of a 'plaster disaster'. I had experienced the trauma of cottles not holding and plaster spreading out over my table, dripping onto the floor and into my shoes. Now I no longer have any of these problems and find that working with Paperplaster allows me to go from an idea to working with the mould in about 24 hours. In addition to being a trauma-free and direct method

of making and using moulds, it is also economical. One can make a far greater number of moulds from one bag of pottery plaster by extending it with cellulose fibre and creating a thin shell by following the contour of the model.

Mixing Plaster:

To ensure that the moulds may be used for processes from press-moulding to slip-casting and everything in between, I always use USG No.1 Pottery Plaster. I also use the manufacturer's recommended ratio of plaster to water in order to achieve the correct hardness and absorbency for use with clay. Generally, the ratio is one part water to 1.3 parts plaster by weight and is often called a '70 mix'. This ratio will yield an absorbency of 40 percent, which is perfect for slip-casting. The plaster has sufficient hardness to be durable but is absorbent enough to ensure that the slip will both cast and release properly. I weigh both the water and plaster by using a tare balance scale and zeroing out the weight of the stainless steel bowl or plastic bucket that I intend to use. I can easily weigh the water using metric measurements, as one millilitre (1 ml) of water weighs one gram (1 g). For example, 100 grams of water is weighed to which 130 grams of plaster is added for a total weight of 230 grams.

I start by weighing out lukewarm water in the container and sprinkling the plaster into the water until the correct combined weight for the plaster and water is reached. The plaster is allowed to slake, or wet out completely, before I start to mix. Using a gloved hand, I gently agitate the plaster for one to two minutes, being especially careful not to create any air bubbles. I then wait, stirring occasionally as heavier particles may begin to settle, until the plaster has just begun to increase in viscosity. It is at this point that the plaster may be used for both conventional and unconventional mould-making processes.



Top: ***Figure 3.***
Above: ***Figure 4.***

This waiting period is an important step that is often left out. If plaster is poured too soon, the heavier particles will settle against the model creating a denser, less absorbent surface called a 'hard face'. This may result in the clay not releasing properly. If you have ever seen a layer of water appear on the surface of the plaster that you have just poured, you have likely poured it too soon. Most of us were taught to mix plaster by eye, putting an arbitrary amount of water into a bucket and sprinkling in plaster until it mounded up in the centre. This is a hit and miss method, and while it may suffice for a simple press-mould or a bat where specific absorbency is not much of an issue, it will create a big problem for slip-casting moulds, and especially for multi-part moulds. Each part of a multi-part mould must have the same degree of absorbency to ensure that the particles of casting slip accumulate at the same rate and give a consistent wall thickness. The method of weighing both the plaster and water that I have described ensures that each time the plaster is mixed it is of equal absorbency and the beginner will be confident that the correct ratio has been achieved, leading to a successful result.

Top: ***Figure 5.***
Above: ***Figure 6.***

For plaster clean up in the studio, it is imperative the no plaster ever goes down the drain, as it can harden in the plumbing and create a huge problem later on. Excess plaster should be poured onto newspaper, or if using a plastic liner bag in your mixing bowl, discarded in the garbage when it has set. For wet cleanup, I use a medium sized garbage can lined with a heavyweight garbage bag half filled with water. This is used for cleaning wet plaster off of gloves and tools. When I am finished my mould making cycle, I simply let the water stand overnight, allowing the heavy particles to sink to the bottom. I decant off the clear water, which can be poured down the drain, and leave the sludge in the bottom of the garbage bag. This can be discarded wet or dried out and thrown in the garbage. By using these simple steps, one can make moulds with a minimum of effort.

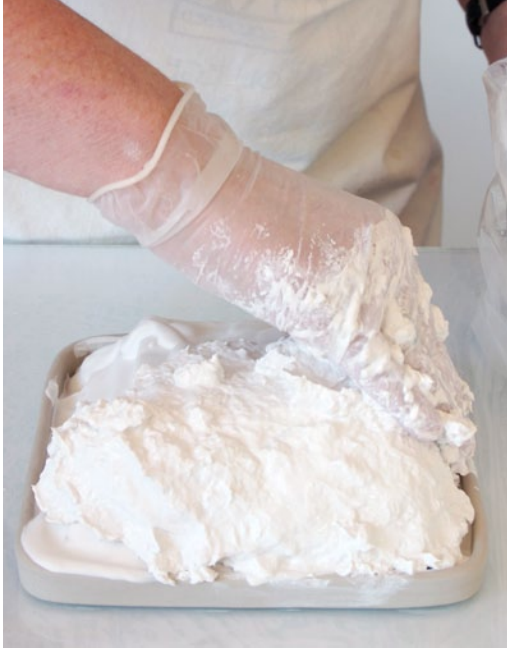
A General Description of the Process:

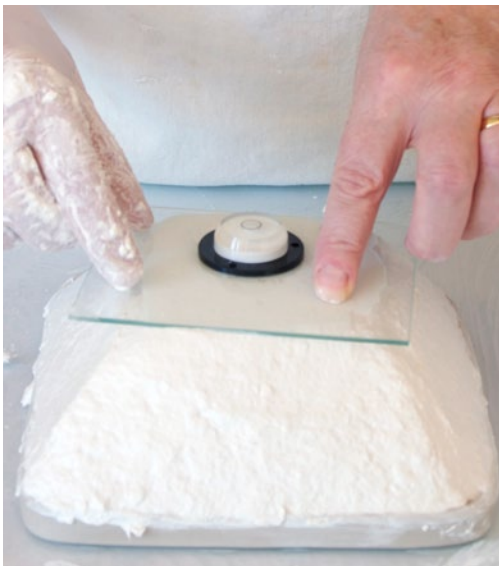
The process of making a Paperplaster mould is rapid, 'low tech' and does not require any specialized equipment other than a weigh scale, such as a commercial kitchen scale, with a tare balance.

- First, cover the work surface with a sheet of construction grade plastic film. Clean up is easy as any dripped plaster will peel off the plastic sheet when it has set and can be discarded.
- As one would proceed for conventional mould-making, the model is prepared by being set on to a non-porous surface. I find that a piece of plate glass with ground edges works best.
- Using a flattened coil of clay, a dam is placed about ½ to 1 inch (1 to 2.5 cm) away from the model and gently secured to the glass [Figure 1].
- The model and glass sheet is prepped with mould soap as required.
- A 'milk coat' of regular plaster is weighed out [Figure 2] and mixed. A tip for clean-up: Wendy Kershaw from Glasgow, Scotland suggested lining the bucket or bowl with a disposable plastic bag – preferably biodegradable – so that any excess plaster can be discarded into the garbage. This leaves the bucket clean with no wet wash-up required. When the plaster has increased in viscosity and is ready to pour, it is drizzled over the model to a thickness of about ½ inch (1 cm) [Figure 3]. Bubbles sitting on the surface that are obscuring the fine detail can be eliminated by blowing at them through a narrow plastic drinking straw. This will drive the air out and the plaster into the fine detail. This a trick used at the factories in Stoke-on-Trent, England that was also passed on to me by Wendy Kershaw.
- Resist the temptation to mix cellulose fibre into any of the left over milk coat plaster. Trying to apply the Paperplaster before the milk coat has properly set will damage the first layer and result in cracks, rendering the mould useless. Take your time, …because you can. The first layer can be left overnight, or even longer, before the Paperplaster layer is applied. When the milk coat has set (heated

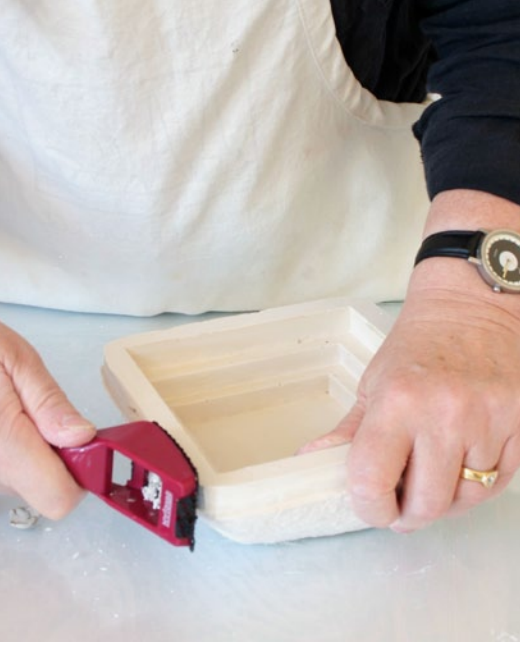
and cooled) and can no longer be easily disturbed, the Paperplaster coat can be applied.

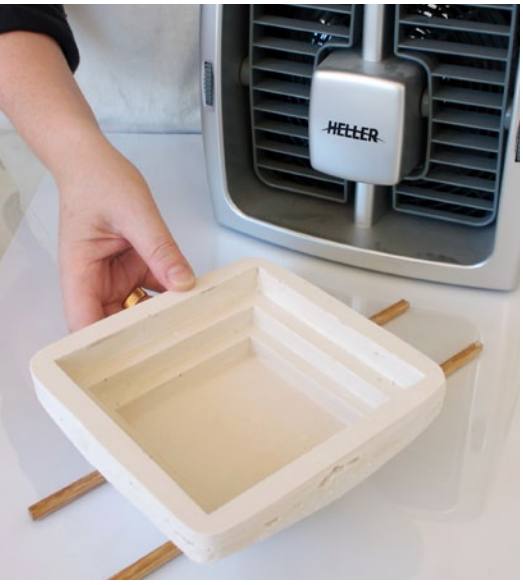
- Mix up the plaster using the 1:1.3 ratio and gently agitate for one to two minutes. This time, do not wait for it to increase in viscosity but add the dry fibre or toilet paper [Figures 4, 5]. The toilet paper can be added directly into the plaster – unrolled and submerged in one gesture – and blended in. While the dry cellulose fibre insulation can be added as is, fluff it up first and add it a bit at a time blending in as you go so that you can judge the consistency. As a general guide, use 3 percent by weight of the combined weight of the water and plaster – you may need more or less depending upon how dry the atmosphere is where you live – and blend it in until the mixture is the consistency of cooked oatmeal. The material should easily stick to your gloved hand when you hold it vertically [Figure 6]. Be careful and err on the side of the mixture being too fluid. If it is too stiff, it will not bond properly to the milk coat.
- Being careful not to create voids between the milk coat and the Paperplaster coat, apply the Paperplaster mixture over the milk coat by gently jiggling the mixture on in order to drive out any air pockets and to ensure that liquid plaster comes in contact with the previous layer [Figure 7]. Use the clay dam as a guide to determine how thick to make the layer (½ in or 1 cm).
- Only mix up as much Paperplaster as you can handle at one time. The beauty of this method is that you can stop and start at any time. If you run out of Paperplaster, simply 'feather' the edge where you ran out so that the new batch can overlap it.
- A foot can be applied to the mould by adding a cylinder of extra Paperplaster mixture and levelling it using a small piece of plate glass and a spirit level [Figure 8]. This will allow it to sit level when you are working with the mould right side up.
- When the Paperplaster has set (heated and cooled) the mould can be removed from the model. The mould should be rasped with a Surform tool immediately and the edges rounded off so that pieces of plaster cannot chip off and get into your clay [Figure 9]. Once the Paperplaster has cured completely and dried, it is very difficult to carve.
- The mould can now be dried completely. Ensure that multipart moulds are secured together with elastic bandages before drying to prevent any warping. The simplest drying method is to set the mould on a rack or support in front of a household fan so that air can pass over all the surfaces [Figure 10]. Be careful not to dry too hot or too quickly as this tends to cause shrinkage between the two layers resulting in delamination and cracks in the milk coat. Never attempt to dry a mould in the oven or a kiln, as temperatures above 140°F/60°C will damage the plaster. Generally, a mould will dry overnight and be ready to use the next day [Figure 11].
- Paperplaster can be applied over dry Paperplaster, or even regular plaster surfaces, at any time. I have repaired broken Paperplaster





Top: ***Figure 7.***
Above: ***Figure 8.***





Top: ***Figure 9.***
Above: ***Figure 10.***

moulds by piecing them together and applying a generous coat of Paperplaster over the outside of the break.

Cellulose Fibre:

Boric acid-free cellulose insulation or toilet paper: Initially I used commercial cellulose fibre insulation, however, I did some research into what the industry uses as vermin proofing and a fire retardant and learned that it is boric acid. Boric acid can cause irritation and must be used with care. (URL: http://digitalfire.com/4sight/hazards/ceramic_hazard_boron_326.html for the article: "Boron Compounds and Their Toxicity", by Edouard Bastarache MD). I spoke to a local manufacturer of the insulation and they agreed to sell me the fibre before the boric acid was added. I therefore recommend that every effort be made to secure a supply of the boric acid-free cellulose fibre. The insulation is mostly made from recycled newspaper and tends to be dusty, therefore a respirator suitable for dusts must be worn when handling both the boric acid-free and commercial insulation to prevent inhaling the fibres. Another ready source of cellulose fibre is toilet paper. Good quality toilet paper breaks down very quickly, is easily incorporated into plaster and one does not have the issues with boric acid and airborne fibres. It is surprising how far one roll of toilet paper will go when making a Paperplaster mould. For ease of use, and in the spirit of keeping the process low-tech, toilet paper is probably the recommended option for making the occasional Paperplaster mould.

Mould Use:

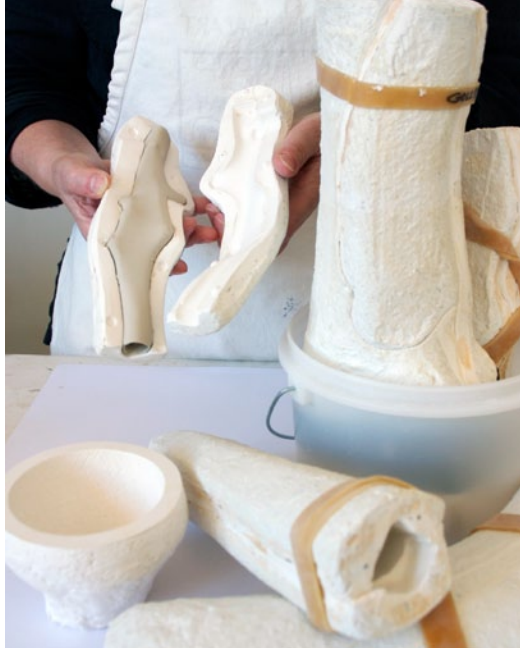
Slip-casting: Almost all of the moulds that I use these days are Paperplaster. I use them for both slip-casting and press-moulding. The scepticism that I encounter with regards to the moulds is that one cannot use them for slip-casting. Not so. I have used them successfully and have done so for the last 14 years. I make all of my moulds with the intention of being able to use them for slip-casting if I choose to. I use the water/plaster ratio of 1:1.3 no matter what the intended use for the mould is; I like to keep my options open. The Paperplaster mould takes on the shape of the model and, because of its often-strange form, I may have to set it in a bucket or some similar support to keep it in an upright position while slip-casting. The only drawback is that Paperplaster moulds tend to have a thinner wall mass than conventional plaster moulds and will therefore saturate more quickly. One may get only one or two casts per day from a Paperplaster mould. An advantage to the thin wall, however, is that while it saturates quickly, it also dries very quickly. It will be ready for use again simply by setting it in front of a fan for an hour or so.

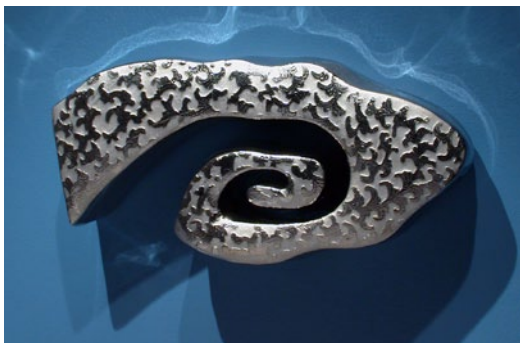
Press moulding: Very large moulds can be made using Paperplaster. The largest mould that I have made to date was six ft/l, three ft/w, and 12 in/d (183 x 91 x 30 cm). Large drape or hump moulds can be made which are easy to handle, even when filled with clay. They are also easy to store, as they can be easily lifted and placed on high out-of-the-way shelves when not in use. Large-sized conventional moulds often take up valuable floor space in a small studio and their

unwieldy weight prevents them from ever being put away.

Drying and throwing bats: Most studios have a bat for drying out scraps and reclaiming clay. Often, this drying bat takes up valuable table space because it is too heavy to move. I have taken to making thin Paperplaster drying bats that are about 2 in (5 cm) thick and 24 in (60 cm) square. They are set on thin pieces of wood or metal to provide a space underneath so that air circulation can help the evaporative process. When the bats are not in use, they are easily stashed away freeing up table space. In the studio at Red Deer College, we have one-inch thick Paperplaster throwing bats that have been in general studio use for over eight years. They are resistant to scoring, chipping and breaking and have stood up to all the vagaries that institutional use has thrown at them. The bats are first dampened and then secured to the wheel head with a slurry of clay. The moisture in the clay is drawn into the plaster creating the suction that holds the bat in place. The thrown item need not be cut off with a wire, as it will pop off readily after the plaster has absorbed some of the moisture from the clay. This is especially good for throwing an item, such as a plate, that has a wide foot. The underside surface of the pot remains flat, which also aids in trimming a level foot in to the piece.

As a sculptural material: Paperplaster is also a very manageable sculptural material. It is easy to manipulate, sticks to vertical surfaces and can be applied over a skeletal form of wire, screen or fabric to make a very strong thin surface. Paperplaster may also be used to stabilize and reinforce plaster bandage moulds and to make mother moulds for backing up silicone moulds when making wax models for bronze casting.





Top: ***Figure 11.***
Above: ***Chinese Cloud Spiral.*** *2007. Porcelain with underglaze transfers and Physical Vapor Deposition. 15 x 24 x 10 cm/d.*
Below: ***Trudy Golley.***

Quick Reference Chart:

A 1:1.3 ratio of one part water to 1.3 parts plaster by weight (grams) is used for both the milk coat and the Paperplaster. For the Paperplaster coat, fibre – either toilet paper or cellulose insulation – is added to about 3 percent by weight of the total combined weight of water and plaster.

Water	+	Pottery Plaster	=	Total Weight	Add 3% Fibre
100g	+	130g	=	230g	6.9g
200g	+	260g	=	460g	13.8g
500g	+	650g	=	1150g	34.5g
1000g	+	1300g	=	2300g	69g
2000g	+	2600g	=	4600g	138g

The Head of Ceramics at Red Deer College since 2000, Canadian ceramic artist, Trudy Golley has travelled extensively to participate in residencies, exhibit her work and, through lectures and workshops, spread the word about Paperplaster. Most recently, she was Artist-in-Residence at SODA (Sculptural Objects and Design Australia) in Fremantle, Western Australia. Images of her work can be viewed at www.alluvium.ca. All photos are by Paul Leathers.