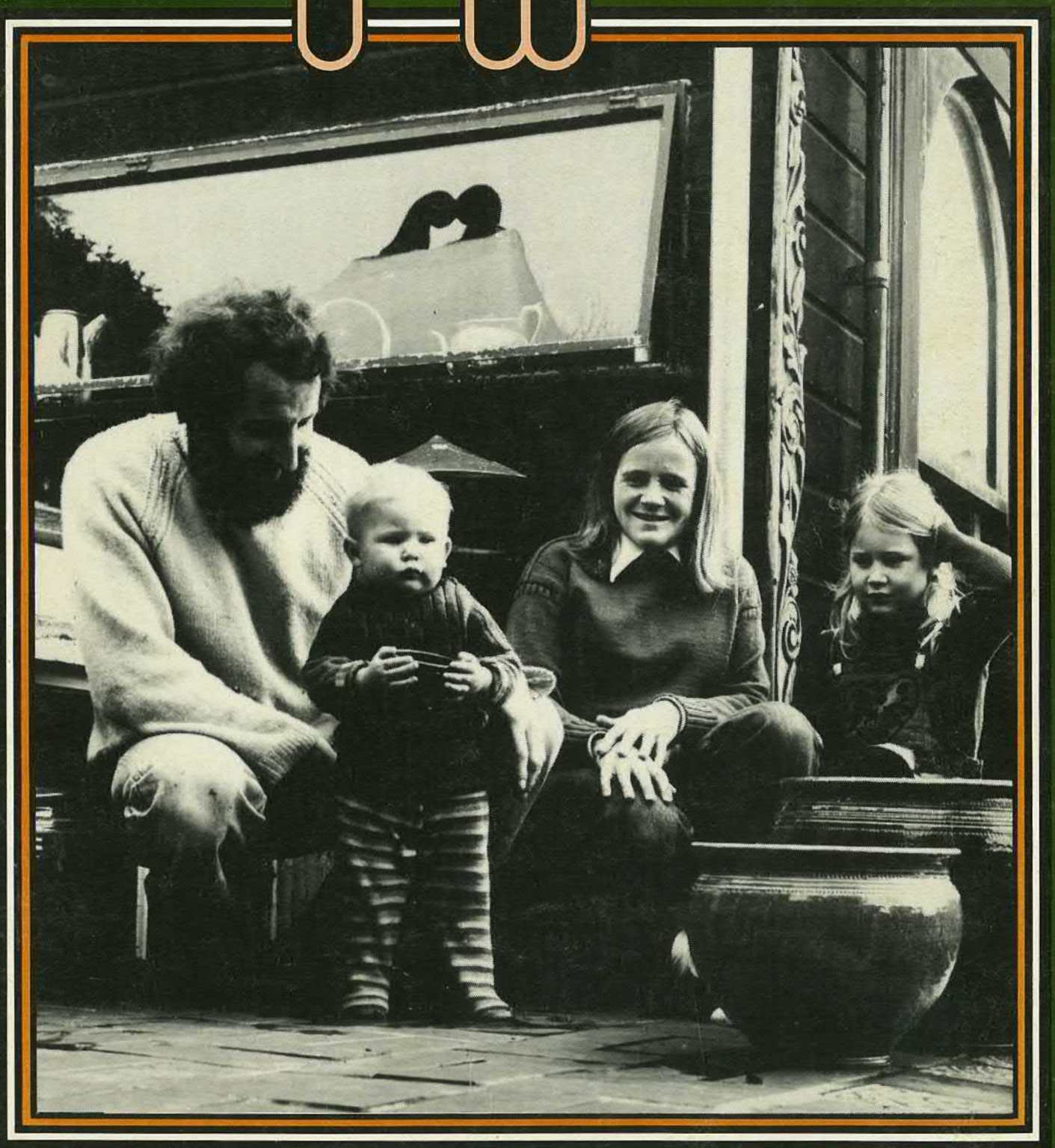
new zealand potter vol 21/2 spring 1979

Potter



Cover: Neville Porteous with his family at home in Khandallah.

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Contents

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Reducing with gas in a silicon carbide rod element kiln

Rosemary Perry

After using an electric kiln for many years I wanted to be able to get reduction effects. I was unable to build my planned oil kiln or an L.P.G. kiln so my problem was how to get reduction in an electric kiln without damaging the elements. I read Robert Fournier's book* which gave me the line to follow.

I decided to have a top-loading electric kiln built with silicon carbide rod elements, and after problems and delays I'm getting some excellent results. There have been many teething problems, mainly over the type and amount of gas necessary for reduction. This method of firing has not been used in New Zealand before and no one could advise me so it has been trial and error. I tried introducing nitrogen, then nitrogen with 5% hydrogen without success. I am now using a small amount of L.P.G. which I can control accurately by a flowmeter which my husband installed for me from an old anaesthetic machine. At present I am working with celadon glazes on porcelain, hoping to be able to produce glaze of the quality made in the Sung Dynasty in China, under these very different firing conditions.

This kiln will not suit everyone for the reasons explained in the article, and I imagine anyone building one would make modifications and improvements so I'm not setting mine up as a model. The services of a knowledgeable and imaginative electrician are required. I'm strictly a part-time potter and my output is small and this kiln does what I want it to.

Silicon carbide rod elements were first introduced in the 1930s. They were used very little in the past for pottery kilns because a very expensive voltage transformer was necessary to compensate for the increased resistance which occurs with use in these elements.

A few years ago, Peter Taylor of Labheat Laboratory and Research Furnace Co. Ltd, 56 Hodge Bower, Ironbridge, Shropshire, England, devised an ingenious method of wiring silicon carbide rod elements which compensated for the increased resistance without needing a transformer or thyristor and heatsink. This is based on 12, or multiples of 12, elements. They are connected in a series/parallel network through a "Sunvic"-operated mercury contactor directly to the mains supply. The loading on the individual elements is only 60% of the nominal loading, and voltage accommodation is not, therefore, important. "Aging", causing increased resistance is so low that the initial loading and "Sunvic" setting are adequate to provide the very small compensation required.

Advantages and Disadvantages of Silicon Carbide Elements:

Advantages:

1 The main advantage is that these elements are hardly affected by a reducing atmosphere. If there is a carbon build-up, this can be cleaned up by oxidizing, and happens automatically during cooling water under oxidizing conditions above 1000°C.
2 They have a considerably longer life than other elements if treated with care. Their life is more likely to end from accident than wear.
3 They are self-supporting within the kiln, and therefore a high temperature ceramic fibre material can be used to line the kiln.
4 They withstand, and are more reliable at, higher temperatures.

Disadvantages:

1 Their cost is much higher than Kanthal wire elements. In 1977 the cost of one rod element approximately 36" long with a heating length of 18" was £16 Sterling. This has increased with inflation, but one must also consider their longer life.
2 Like other wire elements they become brittle with use and need to be protected from knocks.
3 Special provision is needed to maintain power because of "aging" or increased resistance.

Method of Wiring Elements

Peter Taylor's method of wiring to compensate for increased resistance in elements is firstly to connect them in three circuits with four elements in each. If, or when the firing time increases by about 10% then the rods can be reconnected in four circuits with three elements in each. After over 30 firings there has been no increase in the firing time of my kiln, so I do not anticipate having to make these adjustments for some considerable time. If necessary there are two further adjustments which can be made. The next makes use of the delta system of three-phase wiring with three circuits of four elements each at 415 volts. Lastly the wiring can be reverted to star with six circuits of two rods in each. I expect and hope that this will not be necessary for many years.

My 15 kilowatt kiln could be wired on single or three phase.

Types of Rods:

Silicon carbide rods vary considerably in their characteristics and some are more suitable for pottery kilns than others.

The silicon carbide elements which Peter Taylor supplies from Labheat are of a much denser structure than the standard commercial elements. They vary in diameter according to their length. They should be 14mm diameter for up to 813mm span rods, 16mm for up to 991mm span, and 18mm diameter for up to 1270mm span.

The hollow rods are not suitable because they have a higher resistance and need a voltage transformer.

Globar (carborundum) elements are rather too open in texture.

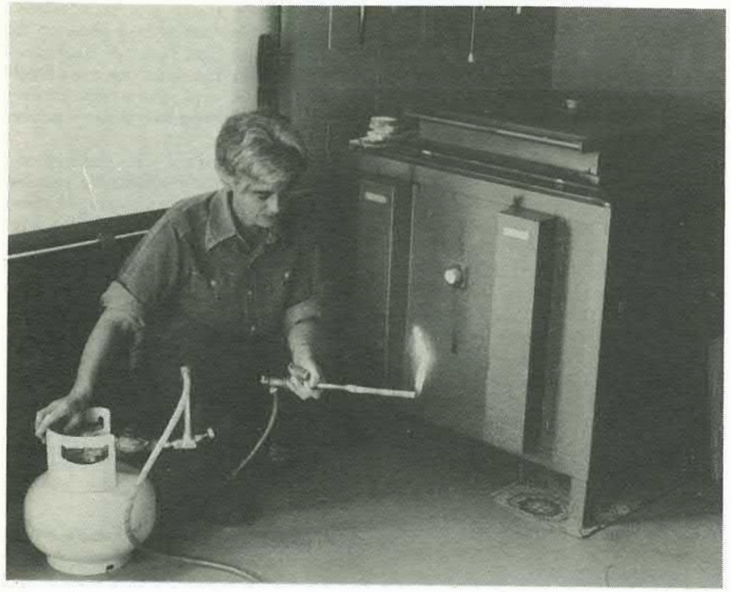
Most rods are straight, but U-shaped rods are available with both connections at one end. These are even more expensive.

Peter Taylor can supply elements and give advice. He was very helpful to me. The biggest problem was the red tape and time involved in applying for an import licence, and delay before receiving the elements. It would certainly be easier if the elements were now available in New Zealand.

Installation of Rods and Kiln Types:

Rods can be installed vertically or horizontally. The rods are made with ends which generate less heat. These sections are fed through the kiln walls, and held in place outside the wall by clips and braids. No part of the hotter central section of the element should be within the kiln wall. The holes in the walls must be drilled carefully in line and have a good clearance for the rods, so there is no stress on the elements with movement from heating. The outside ends of the holes are packed lightly with ceramic fibre. This prevents heat loss and heat damage to the clips and braids. Wide slots in the kiln lining, whether insulating brick or ceramic fibre sheets, give some protection against knocking. Elements should not be closer than one and a half times their diameter, and should be at least half their diameter from the wall of the kiln.

It is necessary to have some protective coverings over the ends of the elements outside the kiln. This will protrude two to three inches in the front and back of a kiln with horizontal rods. It is therefore difficult to fit a conventional type of front-opening door, and easier to make a top-loading kiln. The reverse applies to rods placed vertically.



cally.

Labheat has, however, invented an original kiln with six horizontal rods on either side of an inverted U. A double trolley with three vertical walls runs between, so that two of these walls make up the front and back of the kiln. The third remains outside with the second section which can be packed while the first is being fired.

My rod element kiln was built by Mr Hodgson, adapted from his Kanthal wire kiln design, but higher powered with 15 kilowatts. Its inside measurements are 49cm × 49cm × 54cm deep. It has a layer of cerafelt behind the lining of insulating brick and there is a layer of vermiculite and cement fondu mix between the cerafelt and metal frame. This helps retain the heat. The lid has more cerafelt and no mix to make it lighter. I think this accounts for the very rapid cooling to 1000°C, after which the kiln seems to retain the heat and cools very slowly. This is ideal for celadon glazes. Because there are six elements on either side of this kiln, with none on the floor, there is uneven heating. I use this to advantage, and have lower maturing glazes for the top and the floor which are slightly cooler.

It is debatable whether an all fibre electric kiln is preferable to an all brick. A compromise seems best.

A sound kiln can be made with nine inch walls using a lining of insulating brick with a layer of diatomaceous brick held in place with angle iron over its outer layer of one-eighth thick asbestolux sheeting. This kiln will use more electricity to heat because of the absorption into the brick.

The greatest advantage of ceramic fibre material is its very low thermal conductivity with power saving. Against this is its higher cost. It has the advantage of being light for portable kilns, but its lack of physical strength makes it less durable as a kiln lining. Improvements are being made and no doubt this problem will be solved.

In a ceramic fibre kiln the heat storage is so low that it may be necessary to heat the kiln or "fire down" to prevent too rapid cooling.

My kiln can reach 1270°C within eight hours. At present electricity charges of 3.4 cents per unit, the cost of a stoneware gloss firing is approximately four dollars. This helps compensate for the expensive silicon carbide rod elements.

Another advantage is that it is not necessary to use expensive silicon carbide shelves. They are not recommended because they conduct electricity. The sillimanite or alumina shelves need to be 1 inch to ¾ inch thick with the thicker shelves in the lower part of the kiln.

Alternatives to Silicon Carbide Elements for Reduction Firing in an Electric Kiln

During his visit to New Zealand earlier this year, Professor Kondo from the Kyoto University of Arts, told us that they are using electric kilns with Pyrometric C. elements for reducing. These elements are made from a mixture of 8 aluminium, 28 chrome, 0.5 titanium, plus iron. I do not know how these elements compare in price with silicon carbide rods, or their life expectancy. The kilns have a special fire box, and use either wood or propane gas to reduce. The elements are spaced differently for oxidizing or for reducing.

It has been suggested that it would have been cheaper to use Kanthal A.1. elements rather than silicon carbide, accepting that they would need to be replaced more often. I cannot agree with this opinion. Elements usually collapse when they are nearing top temperature. There is too much time and inconvenience involved in unpacking, replacing elements, and repacking the kiln as well as the expense of refiring. It is a great advantage to have long lasting elements.

Reducing with Liquid Petroleum Gas

To introduce gas into the kiln, a poker with a heat resistant end is needed. This is fed in through a hole in the centre front of the kiln just above the floor. My poker protrudes only two inches into the kiln which is not enough. At first the flame burnt up oxygen and brought about reduction only in the front of the kiln. Now I put the bottom shelf hard against the front wall of the kiln to disperse the flame, and by staggering the shelves (putting them alternately hard against the front and back walls), the flame zig zags through the kiln giving reduction in all areas. This is not an ideal set-up, and I plan to change it. It would be preferable to have a poker the length of the floor of the kiln with small holes all along it increasing slightly in size from the front to the back.

I have not yet proved whether it is better to introduce some air with the gas flame. I had a venturi-type jet welded into the poker but have not been able to use it. With the narrow ¼-inch inside diameter of my poker, and the small flame necessary for reducing, I find that if I introduce air by opening the sleeve at the venturi-type jet, then the flame goes out. Consequently without air the flame is rather smokey. This could account for the smokey patches I have had in some celadons. They may however be due to over-reduction, or to the critical temperature at which reduction is increased. I hope to be able to explain this with further testing. At present I find the very faint coil of black smoke which comes out of the tiny hole in the bung in the lid of the kiln is a very good guide to the degree of reduction taking place. I have had good clear celadon glazes and tend to think the smokey flame introduced is preferable to a clearer one. If a less smokey flame is wanted it would be necessary to have a poker with a wider diameter.

It is important to know exactly how much gas is going into the kiln to be able to work out the minimum re-

quirement for reduction. No one was able to advise on this. It will naturally vary depending on kiln size and air leaks. These can be sealed with cerafelt. The only accurate measuring device is a flowmeter. I was very lucky because my husband was given one from an obsolete anaesthetic machine. This is calibrated for oxygen. After several experimental firings I found that gas varying from 250cc to 400cc per minute is all that is necessary for reduction. Because L.P.G. is denser than oxygen, the reading on the flowmeter calibrated for L.P.G. should therefore be less. This is an exceedingly small flame and a pressure reducing valve attached to the L.P.G. cylinder is essential. The amount of gas used is only about six ounces a firing. I have found that reducing from 1080°C to about 1235°C is all that is needed for celadon glazes, copper reds need longer reduction or they re-oxidize. Successes with reds so far have been when I have continued reducing to top temperature, 1260°C, and through the soak period.

An interesting discovery, contrary to most teaching is that the body clay is fully reduced when reduction has not been started until 1080°C.

Dangers of Reducing in an Electric Kiln with L.P.G.

1 Explosion from unlit gas: this can be prevented by never putting the gas into the kiln below 900°C, after which L.P.G. is self-igniting. I have found that it is not necessary to reduce below 1080°C. I also play safe and withdraw the poker after reducing — but some minutes after, so the oxygen has time to burn the carbon from the end of the poker.
2 Poisoning from inhaling carbon monoxide or sulphur dioxide: carbon monoxide is produced during reduction, and because it is colourless and tasteless it can be a real danger in a confined space. As electric kilns are inside, it is essential to have good ventilation, and preferably a good extractor fan. A carbon monoxide detector is an added advantage. Sulphur dioxide smells like Christchurch smog, so its presence is easily detected.

Alternatives to Reducing with L.P.G.

Because of the dangers of L.P.G., Mr John Kennedy, from N.Z. Industrial Gases, suggests I try nitrogen — an inert gas. However, I found it produced a totally neutral atmosphere, and could get no reduced glazes from it. Mr Kennedy then kindly provided a mixture of nitrogen with 5% hydrogen to try. In theory this should work. Hydrogen is explosive, but not in these quantities. Maybe I didn't use enough gas, but my attempts produced similar results to the nitrogen alone. I tried to get further information and got quite excited at the Sydney Ceramic Conference last year when Alan Peascod mentioned using a mixture of nitrogen and hydrogen for reducing. When I approached him afterwards he could give no concrete advice — only that he had used up to 20% hydrogen and had had inconsistent results. He said he was still working on it, and given time for research would eventually write a paper on it.

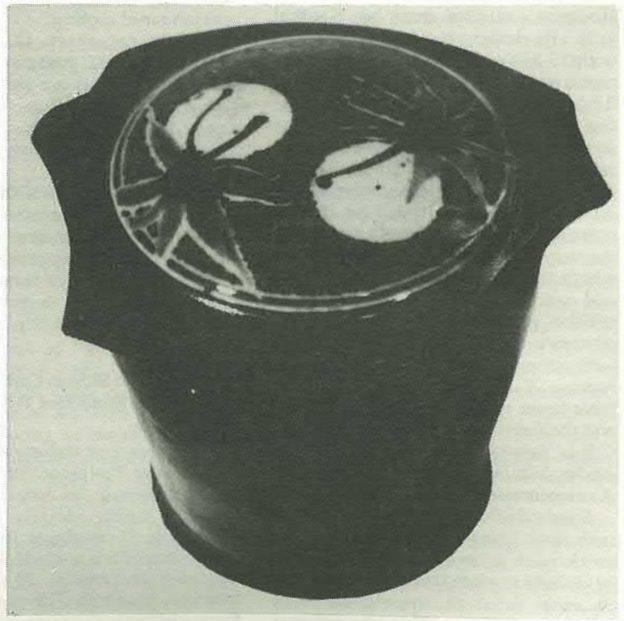
I will look forward with great interest to hearing more about the results of using nitrogen and hydrogen, because if it could be used successfully and safely, it would be a tremendous advance for potters using electric kilns. These gases would not harm Kanthal wire elements and the more expensive silicon carbide elements would therefore not be necessary. Nitrogen and hydrogen have the added advantage of producing no toxic wastes.

Meantime, with time flying by, and little to show for it, I have reverted to using L.P.G. which produces the results I am looking for.

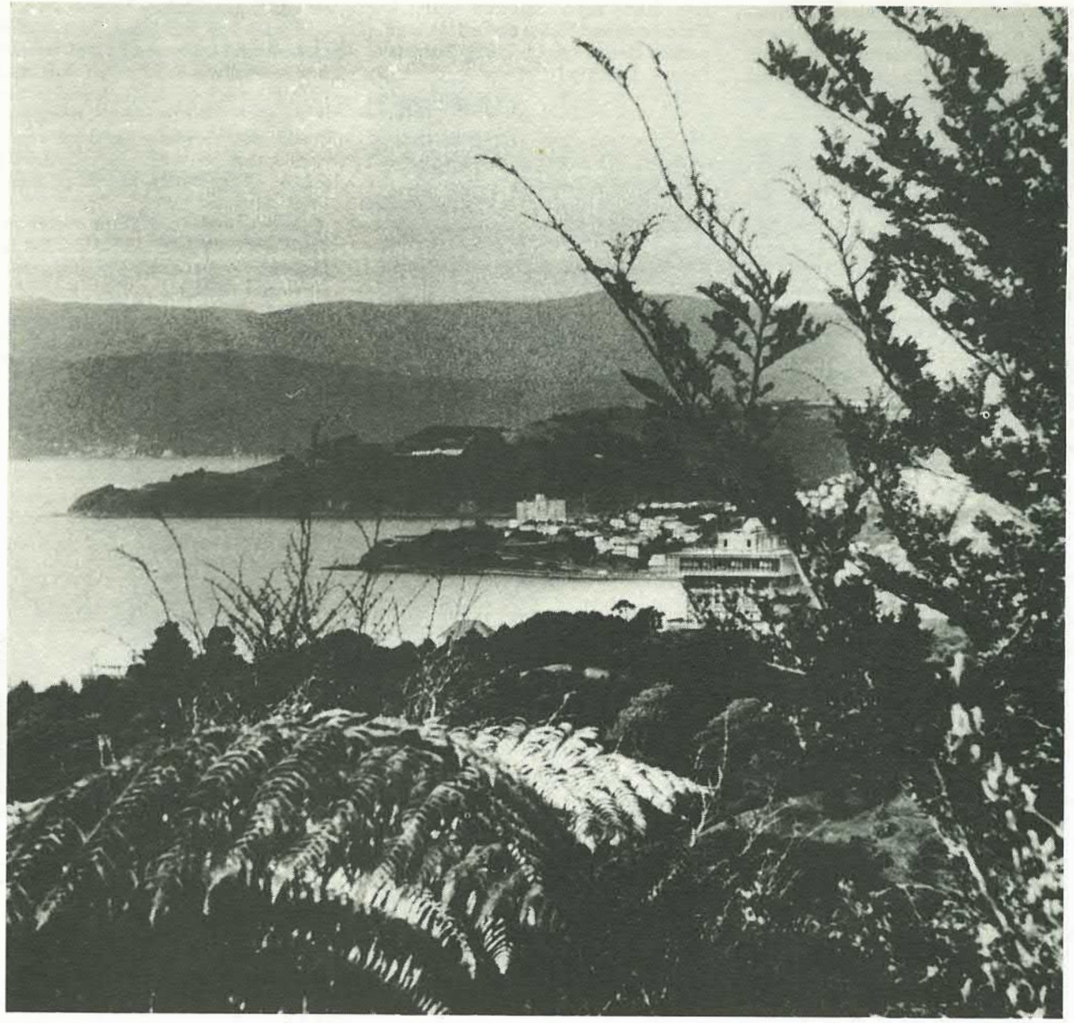
* Illustrated Dictionary of Practical Pottery.

Rosemary Perry
865 Cashmere Road
Halswell
Canterbury

Rosemary Perry lives on a rural property six miles from Christchurch with views across the Canterbury Plains towards the Southern Alps.She and her family have a big hillside garden to tend which includes an area they have planted in nut trees.



Lidded boxes by Peter Hamann. The decoration for leaves and flowers across the moon is celadon and iron with pale washes over wax resist. These and the illustrations for advertisements for Country Arts and Alicat, by Greig Barnet (horse and flutes) are from recent exhibitions.



WELLINGTON POTTERS

Early days

by Audrey Brodie

Not so long ago if you asked the average Wellingtonians about pottery they may well have told you that it is what archaeologists found in ancient ruins — or if they were a little more knowledgeable they might have sent you to a small embroidery shop in Farish Street owned by artist Margorie Mills. There, before the war and on into the early 1950s, you could buy very simple earthenware with brilliant one-colour glazes, the work of one of New Zealand's pioneer potters, Elizabeth Matheson.

Immediately after World War II it was almost impossible to obtain any handcrafted ware at all. So it was a great joy to find in Molesworth Street Miss England's shop. In an early colonial building now torn down for the motorway, she kept a small display of pottery, weaving and other crafts. She travelled to Europe each winter and would return with a few choice selections and then share them with a craft starved Wellington community.

Before 1950 Wellington offered little opportunity for the display of exhibitions. The first true private gallery was opened by Helen Hitchings. Others followed, and one of these, Willeston Galleries, showed prints and pottery to advantage. The family of Wilf Wright took over Stocktons in Woodward Street where one came to find such treasures to own as pots by Lucie Rie, Hans Coper and many other famous named overseas artists and the first seen Japanese Mingei pots in this country. Before long they were holding exhibi-

tions of local potters in their shop. What a bind it must have been to put away stock and set up exhibitions, but this was done frequently and proved a great spur to the local craftsmen.

The Wellington Architectural Centre also opened a gallery which flourished in a variety of locations in Lambton Quay. Sadly the centre gradually faded to linger as the Centre Gallery in Willis Street for a short time. During its lifetime many first exhibitions of potters work were shown and many exciting lectures and schools took place.

Without the early galleries and the opportunities and incentives they gave to the potters and the way in which they developed a critical and informed public, the whole pottery scene New Zealand-wide would not, I'm sure, have flourished and grown as it did.

After 1950 there grew up a group of people who wanted something more than the industrialisation of the last 20 years and a great need for genuine craft was answered by a surge of enthusiasm for hand-made pottery. There was no real tuition available but the exhibitions and frustrations of sharing and exploring the complexities of potting developed a comradeship amongst the early potters.

Helen Mason became friendly with Elizabeth Matheson who was always willing to pass on all she could to beginners. Helen purchased the components of Elizabeth's first oil-fired kiln and rebuilt it. The most spectacular firings followed after the initial gremlins had been smoked out. Lee Thompson and Helen met a little later at pottery classes run by 'Potty' Roberts at Petone Technical College — the early and only pottery classes in Wellington or the Hutt Valley for about 10 years. In these classes would-be potters learned with the tutor whose knowledge and skill amounted to being able to throw a small pot. However, he provided the facilities and enthusiasm needed to start many Wellington potters on their early way.

Lee went on to build in the basement of her Plishke home in Ngaio, a roaring monster of an oil-fired kiln. Many happy hours were enjoyed in the sharing of this facility with other early Wellington potters. Michael Cardew held an exciting workshop here in 1968.

Roy Cowan and Juliet Peter had returned from their studies overseas and began what was to become a way of life with their prints, painting and pottery in Ngaio not far from the Thompson's house. Roy Cowan's technical experience with kilns, which he published in articles in the Potter, helped potters in practical ways.

Doreen Blumhardt at the Wellington Teachers' College established kilns and facilities and gave many hours of extra-curricular teaching.

Gradually the availability of tuition and the supply of materials has improved until the present time when one has many chances to learn and become proficient in the craft of potting.

photos: Ben Woollcombe

Minna Bondy

When I started potting 25 years ago the major difficulty was getting a kiln design of manageable size. There were some designs in overseas literature but for bigger kilns than an inexperienced learner would want, and relying on sophisticated equipment not available here.

I built my first kiln in 1954 to a design sketched out for me by Barry Brickell. It resembled a chimney with a bulging base to accommodate pots at the bottom. The biscuit chamber was above the glost chamber with a fire box on either side operated by oil drip-fed onto trays. This kiln was adequate for a start, but it had serious limitations because of its size (held only four biggish pots), and the unreliable firing equipment.

For my second kiln I obtained some equipment and devised a kiln which I built myself. There were still no plans — this was before Roy Cowan started experimenting with his kiln designs. The firing equipment was mounted on a trolley and wheeled to the front of the kiln, a larger two-chambered kiln with the upper chamber for biscuit above the high temperature chamber. Again it was oil-fed (semi down-draught my own term).

My introduction to potting was through 'Potty" Roberts at Petone Technical College for one year. From the outset I decided that potting would be strictly a hobby, so I have always worked independently and selling was to be of only very secondary importance to the making. It would need to be since I make pots the hard way.

From the beginning I resolved to work with the rocks and sands of New Zealand where lay ready to hand an inexhaustible source of glazes for the potter seeking a genuinely New Zealand idiom. Much as I admired the Chinese glazes on Chinese pots, I could not escape from the logic that they derived from the indigenous Chinese materials and were themselves the results of the patient experimentation that I believed New Zealand potters should subject themselves to with regard to our own materials. Therein lay a fascination for me — to explore the ceramic possibilities of a great variety of our rocks. I collected rock samples from all over the country, guided by the Geological Survey's excellent maps.

To produce the glazes the rocks were crushed and finely ground to go through an 80-100 mesh sieve. From over 100 tests the results were published in 1960 in the hope that others may be encouraged to undertake their own experiments.

Since celadon glazes have been my special interest I've made observations about their character. I'm led to believe that in the celadon field, various rocks poured over a common base glaze, on the same body, in the same firing atmosphere, produce subtle differences.

Minna Bondy's pots are in her well-established style which reflects the vigor coming from an intimate knowledge of the character and performance of her materials.

Doreen Blumhardt

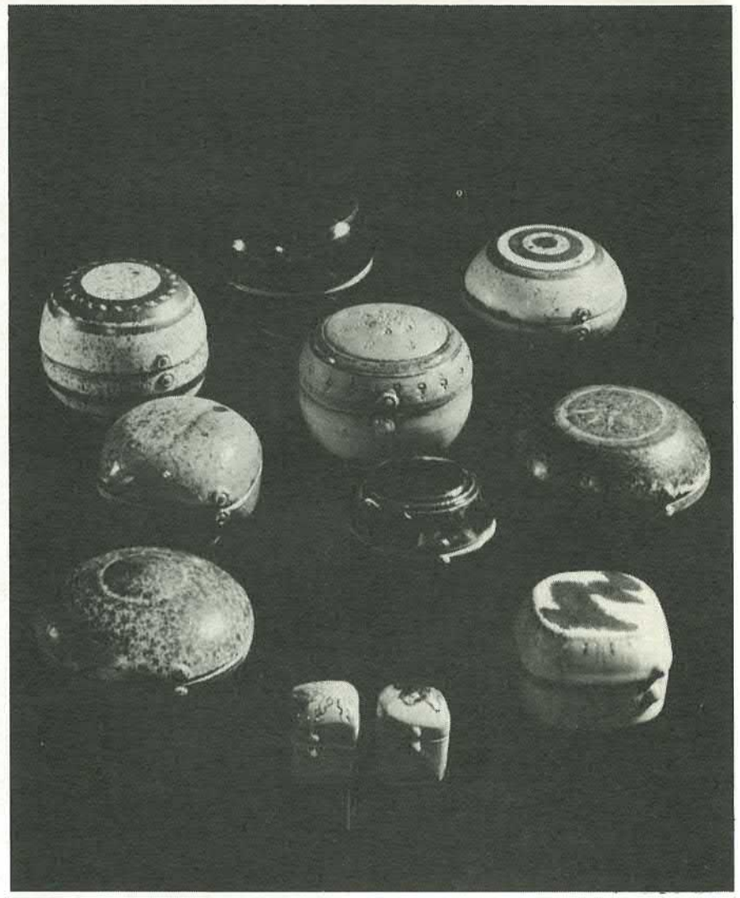
Studio potter 30 years, seven full-time. Foundation member of Editorial Committee New Zealand Potter. *Honorary Life Member New Zealand Society of Potters, President 1969-70. In 1962 spent six years in workshops in Japan. Art teacher, traveller, lecturer, writer, gardener. Makes stoneware, domestic and decorative ware, garden furniture, fountains, planters and murals.*

Pioneering days

As Head of the Art Department of the Wellington Teachers' College for 21 years, Doreen stimulated and fostered pottery awareness. She arranged for the importation by the Department of Education of their first electric kiln in 1944. Doreen and Barry Brickell built an up-draught oil-fired kiln at the college in 1955-56 which used a vacuum cleaner for a blower, and a hub cap for the oil to drip into. This first stoneware kiln to be built locally survived 72 firings.

"The students and I used this method of firing (vacuum cleaner-forced draught) for years in the early fifties. We knew very little in those days and began by dripping oil into two hub caps and then blowing air across them from plumbers drainpipes squeezed together at the end to make a narrow slit. It worked well — though with open drums of oil standing around, it was dangerous.

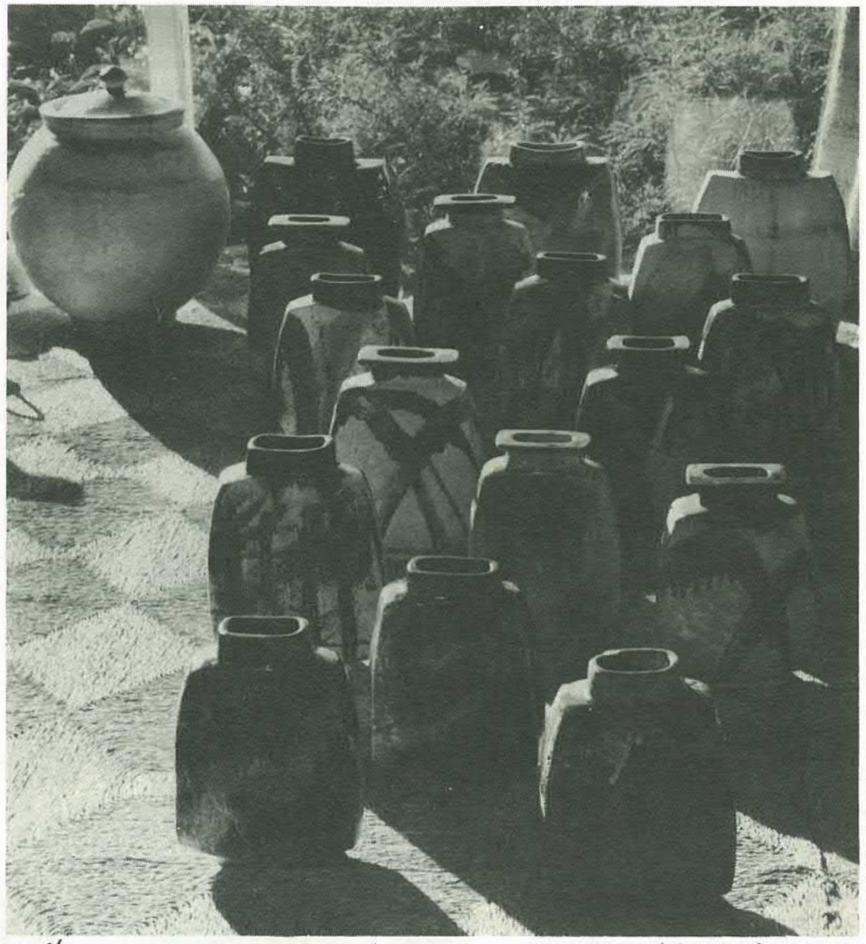
It was an up-draught kiln where everything was too hot at the bottom and frequently shelves collapsed, pots were stuck together and so on. With no proper flashing around the brick chimney, we finally burnt a hole in the roof before the Education Board clamped down on the whole operation.



Group of jewellery boxes, 15cm-12cm diam. *photo: Brian Brake*

Having trained as a painter at Canterbury College School of Art, I enjoy surface decoration, especially on large platters, mostly using straight brush work or wax resist.

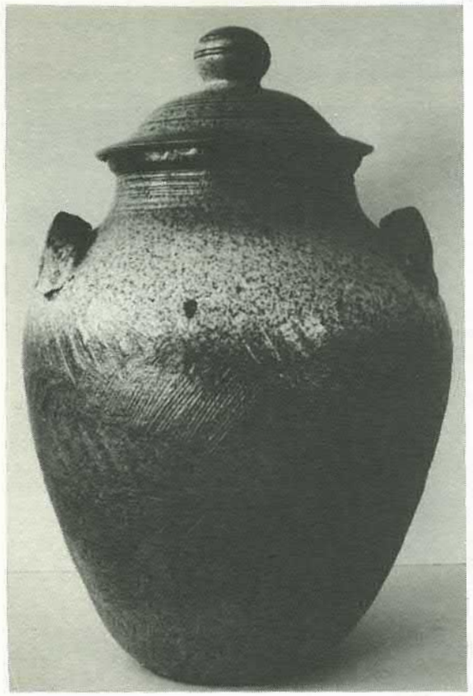
photo: Stan Jenkins

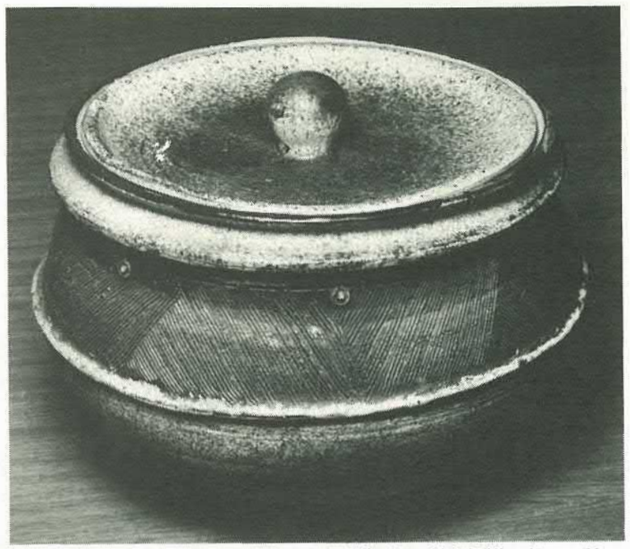


Moulds are made on a board by modelling a half bottle with clay. Around the model about one inch distant from the edges, a wall of clay about half to one inch thick is built & tied firmly around with binder twine or soft string. Plaster of Paris is mixed to about the consistency of whipped cream, then poured over the model. The wall of clay will contain the plaster, but it is important to keep shaping the mould while the plaster allows it, to obtain as even a thickness as possible in the walls of the mould. When the clay model is removed from the mould, it must be thoroughly dried before use. The clay slabs should be firmly pressed into the mould to retain good sharp edges. As soon as the clay comes away from the edges of the mould, it can be removed and kept in a plastic bag until the second half of the bottle has been made. The two halves can then be joined with slip, and a foot and neck added.

Slab bottles made in a variety of plaster moulds decorated with iron sand, wax resist or by pouring glaze with a ladle. Sometimes sprayed over with a second glaze. Height: 32 to 45 cm. Lidded pot at rear 72 cm.

photos: left, Greig Royale
above, Brian Brake

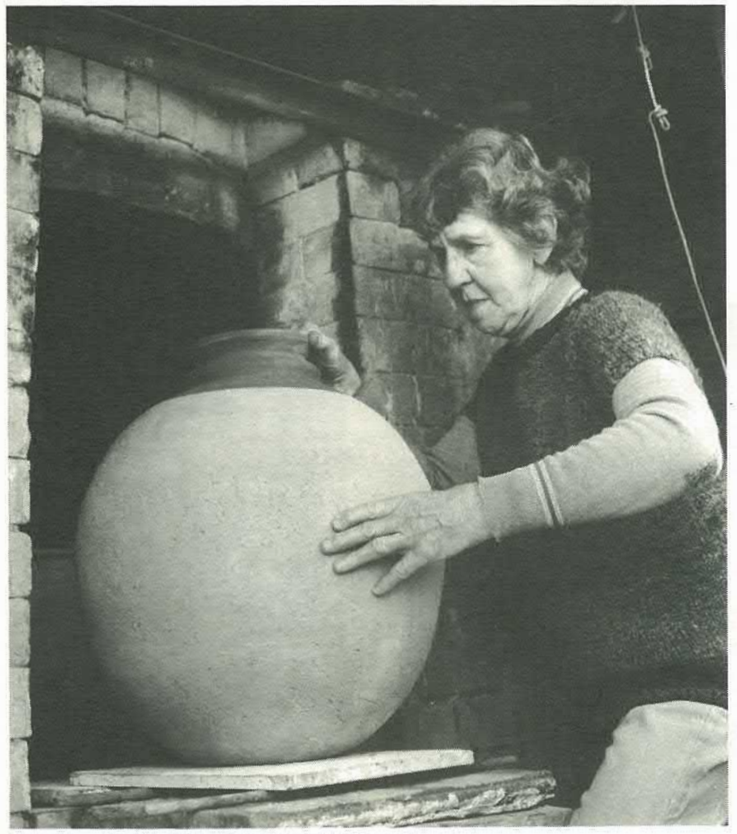




Left: 98cm high. Right: 41cm x 30cm.

photos: Trevor Ulyatt

photo: Greig Royale

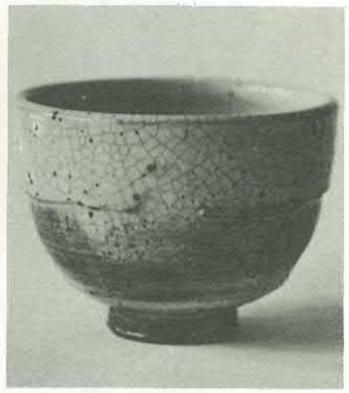


Although I enjoy making small boxes, the building of large pots has been my special love since seeing coiling & throwing combined, an age old technique still being used in Korea and Japan. My problem with big pots has never been the making, but the fact that my kiln is not large enough, & slumping has been all too common, on account of the nearness of the flame. I had to devise a means of getting a pot which only just fits through the wicket, into position in the kiln. Placing a shelf on dowel rods on top of a block of bricks built up in front of the wicket to the required height, the pot is lifted on to this shelf and rolled through the wicket on to a second shelf which is already in position inside the kiln. The dowels are easily removed from under the shelf by tilting the pot.

Jean Hastedt

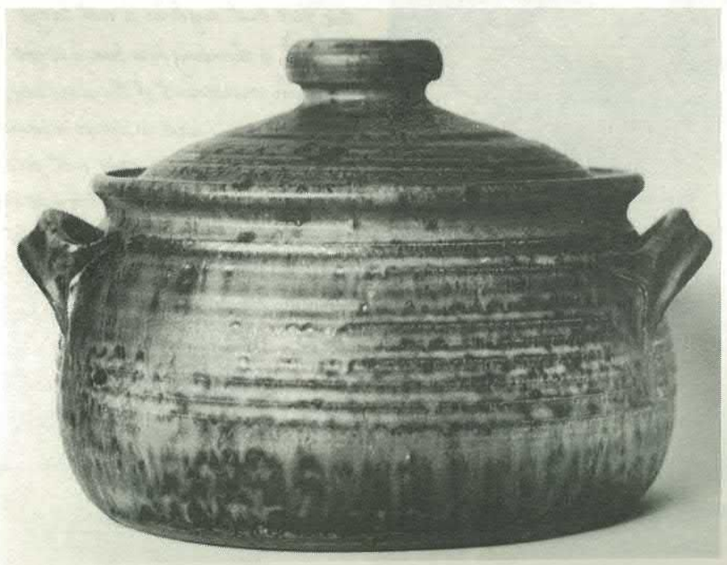
Studio potter six years. Learned throwing from Anneke Borren. After attending Yvonne Rust's summer workshop at Parua Bay, Christmas 1974, 'knew I wanted to pot for a living and a way of life, so packed up my free-lance business and returned for a year's apprenticeship with Yvonne." Established studio in Otaihanga in 1976. Built double chambered down-draught kiln based on Margaret Milne's kiln in Auckland, using Twiss burners. Member New Zealand Society of Potters and Wellington Potters Association.

"I work mainly in domestic ware and especially enjoy making big crocks and making and assembling teapots. For the past year Debbie Pointon has been sharing my studio and together we have been working with glazes — mostly for crackle and Shino type effects. We have also been experimenting with the firing of the oil kiln by adding small pieces of firewood into the firebox through the burner openings at 900°C and find that we get a soft wood ash effect on the glazes and beautiful reduction at 1280°C. The use of wood also reduces the oil consumption."

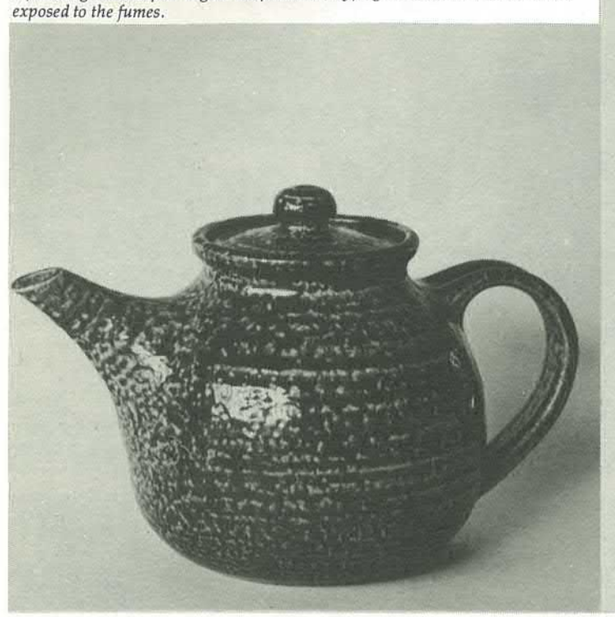


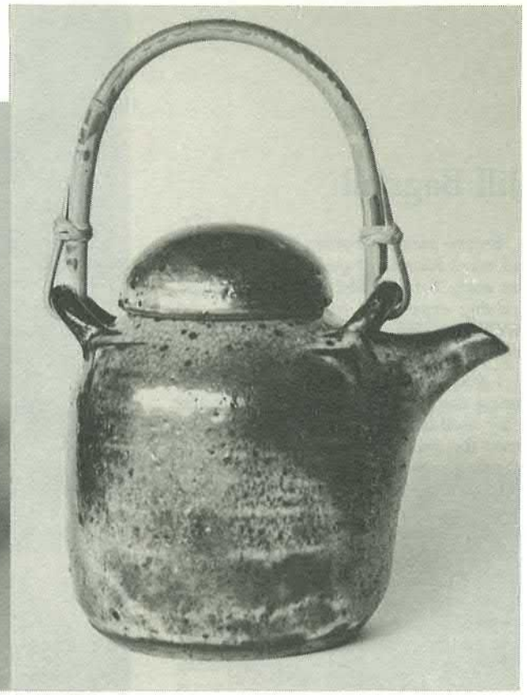
Above: Bowl 4.5 in. high, Shino glaze.
Below-left: Giant-size casserole, dolomite glaze, partially wood-fired.
Right: Storage jar, ash glaze.

photos: Allan Gilpin



Left: Salt glazed teapot. Right: Teapot Shino-type glaze with dark areas where exposed to the fumes.





notes on ash glazing

Jean Hastedt

Anyone working with wood ash must be an experimenter because the degree of tolerance within the kiln is so narrow that nothing can be certain. Ten degrees too hot and the glaze can be over fired. Ten degrees under may be too low and the glaze underfired. Ash glaze at its best gives a beautiful soft effect, lustrous and glowing. Too hot and it becomes transparent with too much of the body showing through. Not hot enough it is dull, like paint.

Pure ash makes for constant glaze effects, but it is possible to use the wood ash from your fireplace. The effects can be just as beautiful, but they cannot be repeated because of unknown variations in the wood.

I use apple tree ash collected from orchards after prunings have been burnt, for a pale creamish green glaze. Macrocarpa gives shades of grey. Among native timbers Matai gives good quality and texture through vital shades of green with darker flecks. A point to be aware of is that these glazes can run, so there could be difficulties over lidded pots fusing. Unwashed ash I've found more likely to run, so I always wash it.

Collect the ash by the bucketful and soak it in water overnight. Tip off the green water. This procedure will need to be repeated three or four times until the water is clear. Then lay out the ash in plaster moulds or a piece of plastic to dry. A warning — ash is corrosive, and dry ash is harmful if inhaled so wear protective mask and gloves.

You will need to experiment to find the place in your kiln for your ash glazed pots at approximately 1260°C. I have found the top to be the coolest in my kiln.

I emphasise that you need to be an experimenter because by the time you have stabilised the glaze you have run out of that particular batch. But I recommend working with ash glazes for those who like a little of the unexpected in a firing.

YVONNE RUST'S ASH GLAZES

1250°C-1270°C

Glaze A — semi-transparent
- 1 part by volume dry sieved ash
- 1 part by volume dry powdered clay body
- 2 parts by volume feldspar

Glaze B — greenish cream

Make the above liquid then take
- 10 parts by volume of the liquid ash mixture above
- add 2 parts by volume dry dolomite
- add 2 parts by volume dry powdered clay body

Glaze C — rich iron glaze
- 10 parts by volume of liquid ash Glaze A as above
- 1 part by volume of dry iron oxide red

Buttery texture ash — cone 8-9

feldspar	350
woodash	350
ball clay	300
dolomite	38
flint	30

Ash glaze

mixed unwashed ash	200*
feldspar	350
dolomite	150
kaolin	100
flint	200

add 3% rutile
add 2% iron oxide for colour

* Remember warning about unwashed ash glaze

Cream glaze — breaking rust
1280°C-1300°C

potash feldspar	3lb 1oz
kaolin	1lb 4oz
whiting	4oz
dolomite	1lb 3oz
tin oxide	8oz
bentonite	2oz

Jill Bagnall

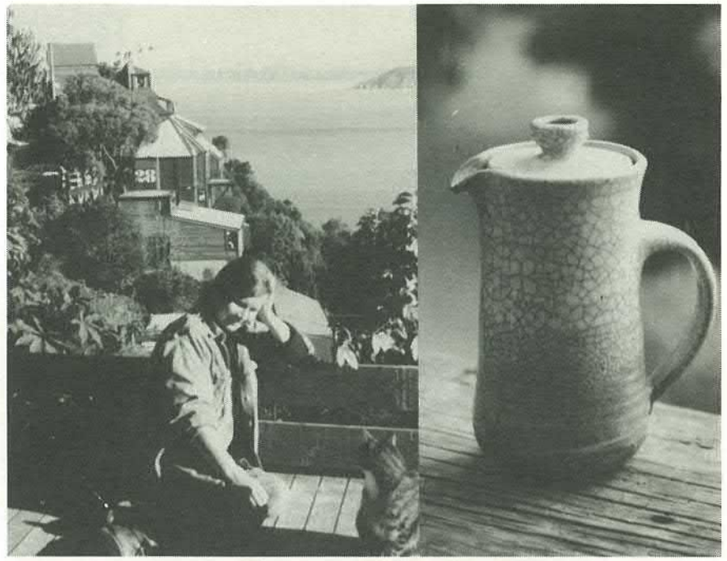
Became aware of potting 15 years ago at a Doreen Blumhardt weekend school. Built an early Brickell test kiln and enjoyed gaining experience from scratch – and books. For family reasons has been a very part-time experimental potter.

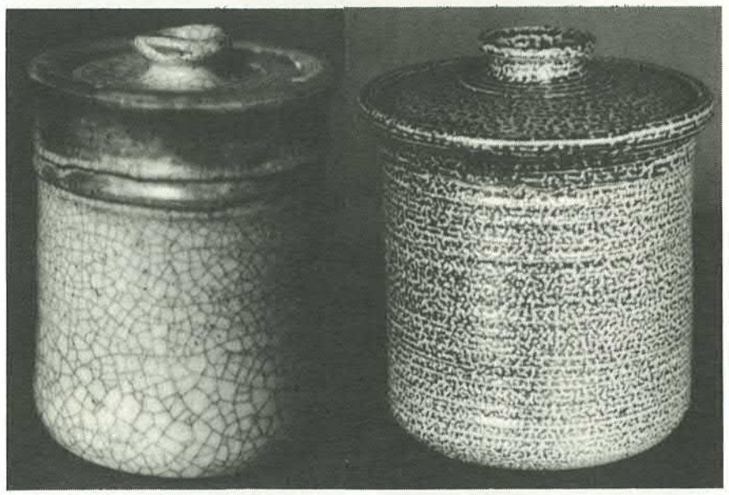
I make mostly domestic ware, preferring the rustic kind of pot where the clay itself is important, and also in contrast the smooth stoney surfaces which some glazes give on porcelain. I use Nelson clay but add grog, rust and other additions for texture. I'm very conscious of form and I find it hard to be consistent about making good pots all the time. I feel I am only now coming to terms with glazing. Some glazes can be applied without problems, but I enjoy the struggle with the difficult ones like Shino type where the relationship between where glaze is thick and thin is so important. I see it all now as part of a learning process where, hopefully, we are always moving on to new ideas.

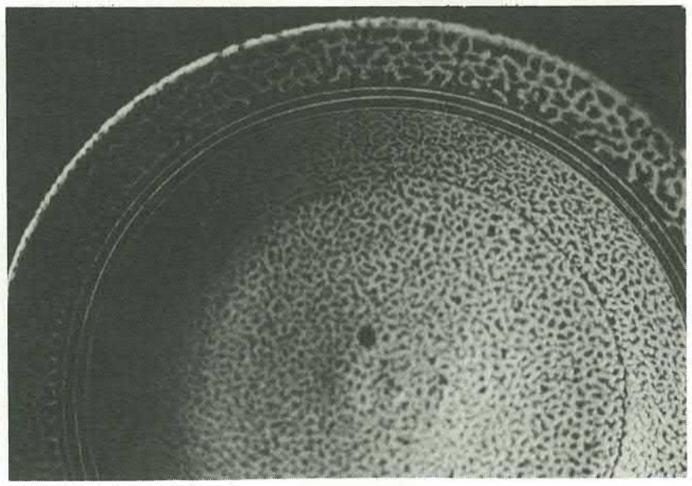
I fire a 15 cubic ft. catenary arch kiln (which I built myself) with two atomizing oil burners, outside a cliff-hanger studio/workshop looking out to sun and sea. With a group of friends I share occasional salt glaze firings in the Wairarapa kiln described in *N.Z. Potter* Vol 20/2. Now that my husband is teaching part-time and sharing household duties, I will at last be working enough to call myself a potter.

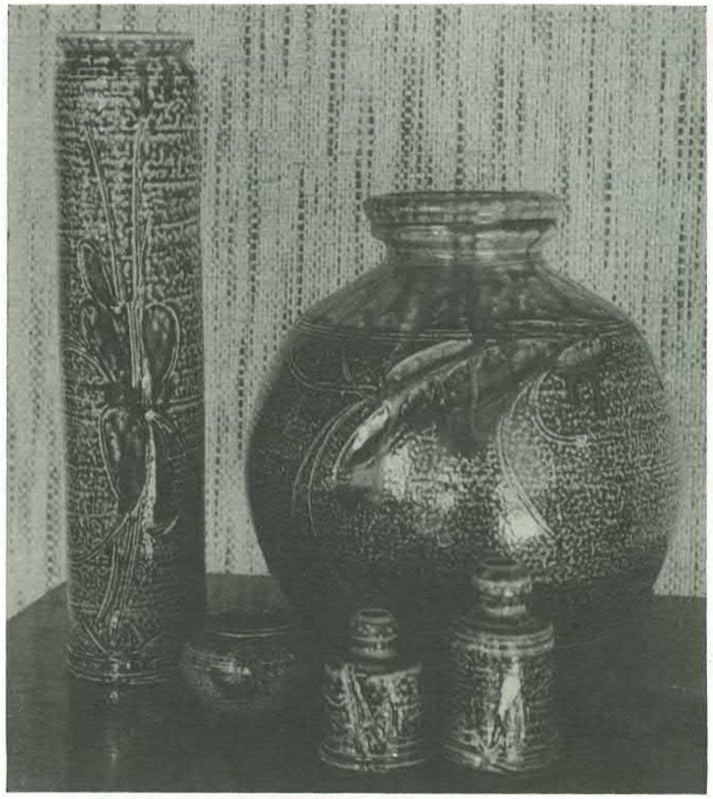
The following glazes I have developed fairly recently for use on porcelain. The first has a very matt stony smooth surface and can be fired anywhere in the 1260°C-1300°C range. It is beautiful at about 1300°C with ½% of ilmenite which gives a soft speckle. It doesn't run at all. The second is a good celadon, not over-shiny but shows the body well. If you use West Coast china clay which contains a little iron you get a soft celadon without extra iron added.

1. **Barium stony matt**
   1260°C-1300°C
   barium carbonate 17
   nepheline syenite 48
   wollastonite 9
   china clay 20
2. **Celadon**
   1250°C-1280°C
   potash feldspar 50
   talc 15
   china clay (West Coast) 22
   dolomite 14



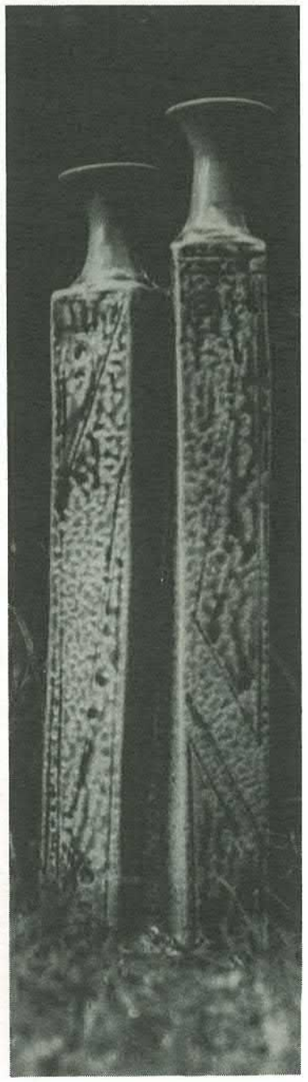


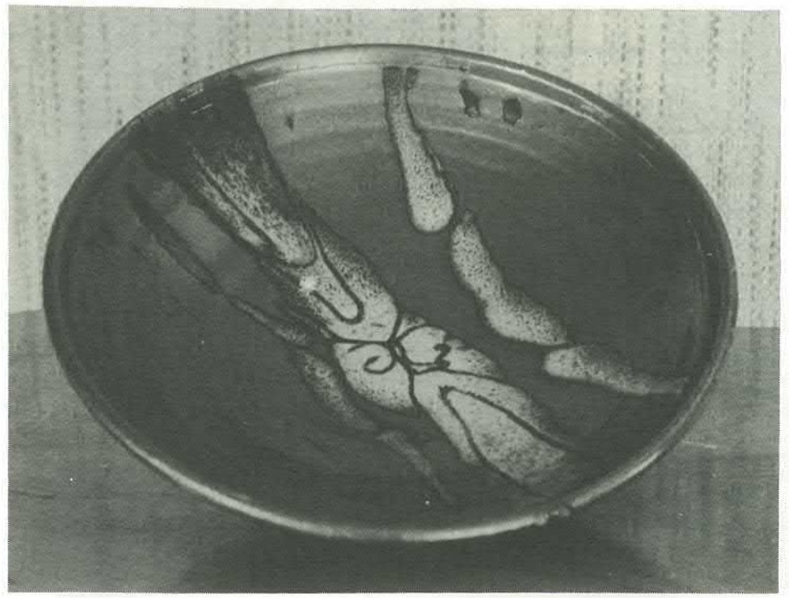


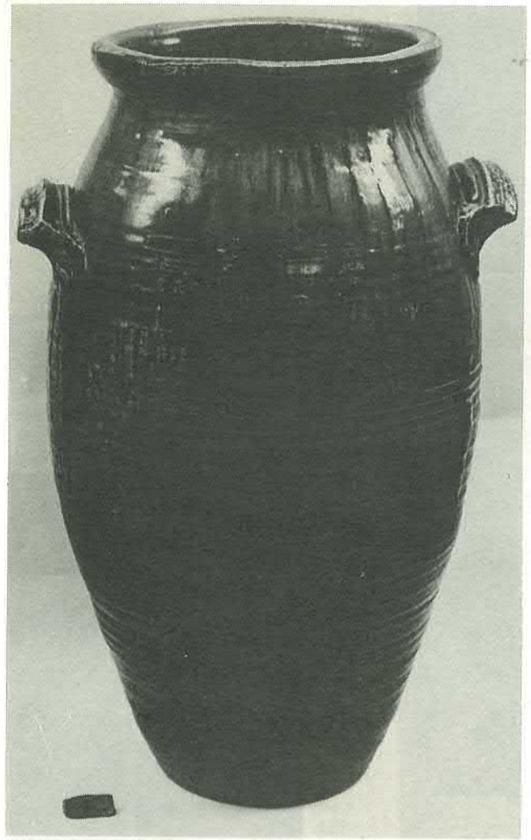


Flora Christeller

Potter 20 years, Diploma Fine Arts Canterbury University. Enjoys teaching, currently night classes at Upper Hutt College and Visual Arts Students Section at Victoria University. Likes to relate pots to the earth and the bush.







Arie Van Dyke

Arie Van Dyke is an active member of Wellington Potters Association and New Zealand Society of Potters. He manufactures kilns and other equipment and pots when he has time.

Pot left, is 85 cm high with a combination of four glazes.

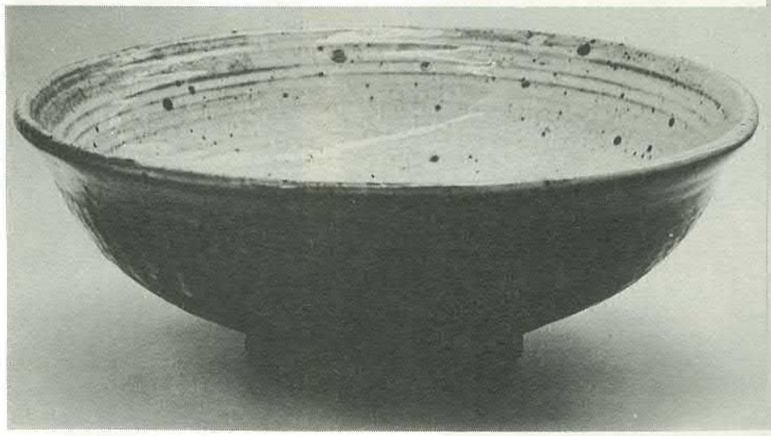
Debbie Pointon

Thelma Lamont

Below and right: Bowl, Shino glaze, 33cm wide, and pot 40cm high, ash glaze. "Interested in kiln building to the extent that it has impeded progress in potting."

The pots on this page are by members of the Wellington Potters' Association shown at the Annual Exhibition at the Cultural Centre in July.

photos: Allan Gilpin

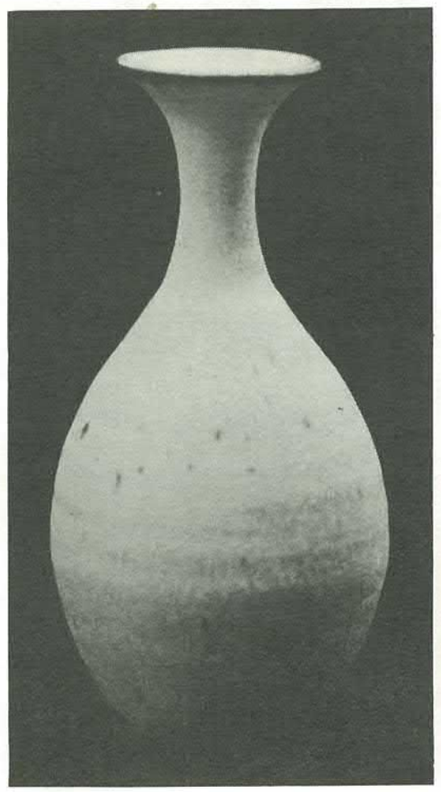


Jan Fleming

Self taught domestic ware potter. Likes strong pots with definite rims and handles. Works with three basic glazes. Workshop at home big enough to provide a sales area and a large Cowan type down-draught oil kiln fired with four jet burners. Part-time potter. Member of the Wellington Potters Association and New Zealand Society of Potters.

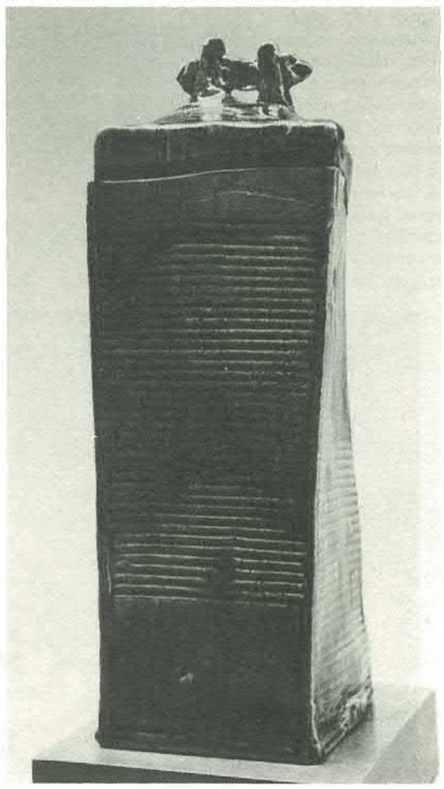
Carol Wilson

Narrow necked pot, 20 cm high. High alumina matt glaze with manganese addition to the body. From Wellington Potters Exhibition.



George Kojis

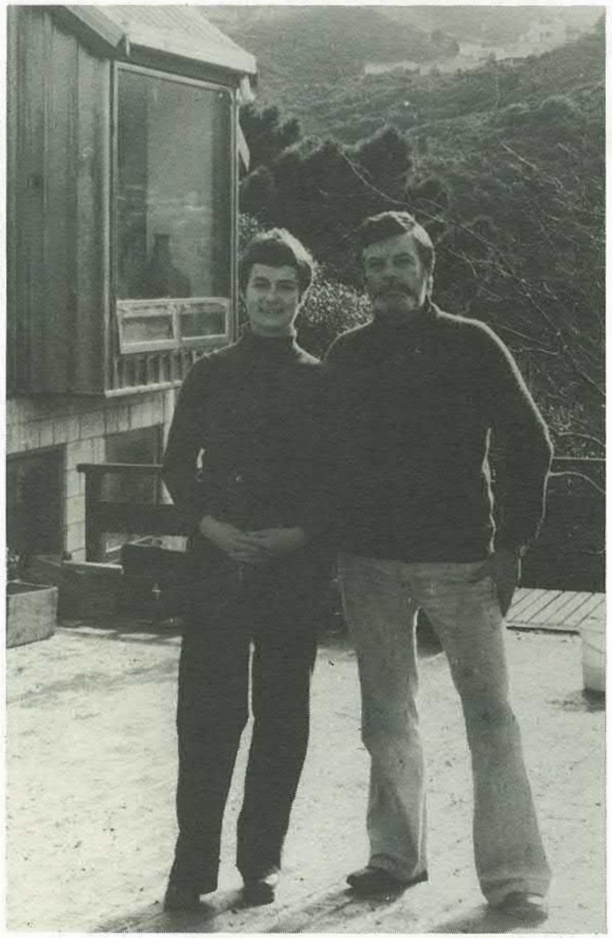
Slab pot ash glaze shown at NZ Academy exhibition. Approx. 60cm high. Potter and teacher, George conducts many schools and workshops throughout the country.



Jenny Shearer

Domestic potter in stoneware and porcelain. Five years tutor Wellington High School. Works full-time, but as family circumstances dictate. Sells to shops and has an Open Day at home several times a year. Member of the New Zealand Society of Potters. Current President of Wellington Potters Association.

Jenny and David Shearer have designed a house and workshop to enable them to develop a production pottery partnership when the time is right. David makes slabware and is a member of Wellington Potters Association.



photos: Nigel Harris

Through the circumstances of moving house and re-establishing a workshop, I have been reduced meantime to using an 8 cubic foot electric kiln and evolving a type of work to suit it.

I'm making domestic ware in oxidised porcelain. I use Podmore's prepared body and fire up to Orton cone 9 and am finding this a challenging medium. There are some different rules to learn for a potter accustomed to working in stoneware. The porcelain surface is ideal for brush decoration which has given me scope for decoration I have never before considered.

I have concentrated on practical items of small scale, such as teapots, plates, cups and saucers, sherry and wine sets, bowls, trinket boxes and tiny vases.

When working with porcelain bodies the throwing requires extra care. The walls must be fine and the shapes delicate and sympathetic to the medium. The clay has no tooth at all when it is wet, so tends to flop. The answer for ease of handling is to throw dry. Use water for the centring and for pulling up the cylinder, then clean the hands of slurry and water, and have the wheel rotate a little slower. The walls will be more resistant to pulling up initially, but soon they can become remarkably thin, and there is no need to spend hours later turning them to translucency. Bowls and similar items will need turning to make a good foot, but the rest, if thrown finely, can be left.

Porcelain teaset, Jenny Shearer.

Porcelain clay dries quickly and therefore cracks and warps more readily. I bisque well — to 920°C and then give myself plenty of time for the decorating process. It takes as long to fill 8 cubic feet with porcelain as it did 28 cubic feet with stoneware.

Basic oxides and water are used for the decorating, brushed directly onto the bisqued pot, then immersed in a clear glaze. After a search I found a good base glaze which I almost always use. It has a good temperature range, a satiny surface and does not craze. The zinc content contributes to its brightness; it also heightens cobalt oxide to a loud screaming blue. This can be modified by mixing 2 parts iron to 1 part cobalt.

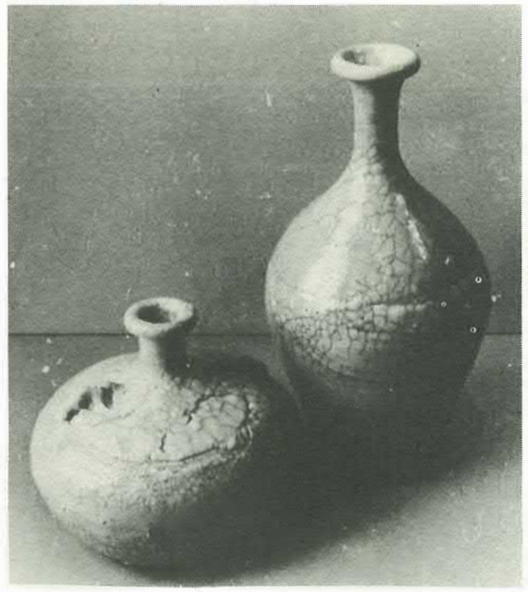
TRANSPARENT PORCELAIN GLAZE
(Harry Fraser)

nepheline syenite	34
whiting	18
flint	30
china clay	16
zinc oxide	2

Recently I have been experimenting with some overglaze colours which will survive cone 9. Rose pink and buttery yellow I bought from our local supplier. Your good stoneware celadon will emerge a charming honey colour and still reveal the delicacy of the clay beneath.

I still love rugged looking stoneware and intend returning to it when our new kiln is operating. Meantime, I've thoroughly enjoyed finding a new approach to my work and the opportunity to come to terms with decorating. A different buyer is attracted to porcelain pots. Its durability is an asset. In spite of its apparent fineness the dense nature of the clay body resists chipping and I have seen a teacup bounce. The price of porcelain pots must be higher because of the extra making time required and the added expense of the clay, but not so high that the buyer feels he must put it in the china cabinet. There seems to be a steady demand for this type of ware.

Above and below right: Pots by David Shearer 30cm high, stoneware glazed first in blue-grey wax resist with a second glaze of tenmoku. Below left: Pots by Jenny Shearer, feldspathetic crackle glaze.

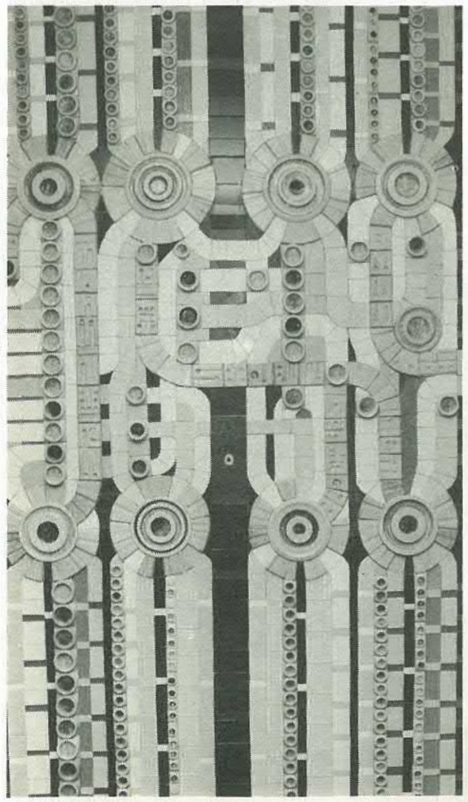


Roy Cowan
Juliet Peter

Roy Cowan designed and made twelve panels for the foyers of the lower and upper ground floors of the newly opened Freyberg Building in Wellington which houses the Ministry of Defence. The mosaic-type mural is based on a computer theme with rows of repeating elements. Over 10,000 tiles are a combination of vitreous materials – hand-made ceramic, industrial tiles reglazed and reshaped and glass of all kinds.

photo: Ministry of Defence

Juliet and Roy Cowan at home in Ngaio.



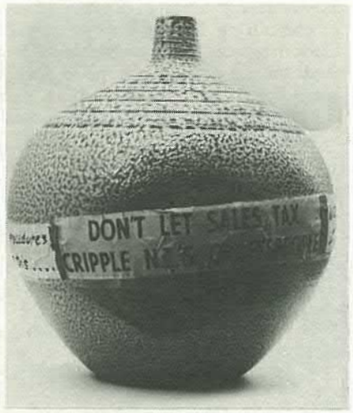
Juliet Peter, potter, printmaker and painter, conservationist, indefatigable protector of individual rights.

Salt glazed unicorn by Juliet Peter from the New Zealand Academy exhibition.

Does Government value craftspeople?

The recently imposed sales tax on pottery and some other crafts puts into question the Government's claim of support for the crafts. Our potters, weavers, carvers, are producing work of originality and character which is appreciated in the remotest farmhouse. A body of workers who can make this type of contribution to a country is too precious to knock. The new tax announcement has invoked a volume of reaction from those making or selling craft and from those who just like it.

At the time of writing, an interdepartmental committee has studied 350 submissions summed up by the Craft Council's report, and for the potters, a costs and income analysis prepared by Roy Cowan. A great deal of new information is now available for the Government's deliberations. We predict it will realise it has met a force to be volleyed with.



Salt glazed pot by Juliet Peter, approx. 60cm high, exhibited but not for sale at Wellington Potters Association annual exhibition at the Cultural Centre in July.

The Queen Elizabeth II Arts Council is totally opposed to the imposition of sales tax on craft goods. We believe that the present regulations in this field are unnecessary and inequitable. On economic, artistic and other grounds we can see few good arguments for retaining this tax.

Firstly, we believe that access to cultural property should not be hindered through taxation on pricing policies. This broad principle, which is enunciated in a number of international agreements to which New Zealand is a signatory, must apply to craft goods as fully as it does to other cultural goods such as books. The works of our potters are not manufactured goods, and they should not be taxed as if they were.

Secondly, the tax as it now has been applied is inequitable. It represents a double tax on craftsmen, and reduces the income they are able to make from their work to virtually a subsistence level.

We also believe that the present regulations are impossible to administer fairly. It is not appropriate for Customs Department officials to be expected to decide whether the work of our craftsmen is ornamental, sculptured or domestic tableware, yet this is what they are being expected to do.

Moreover, the strict application of the tax can only lead to a decline in the standard of the hand-crafted pottery on the local market. For its effect is to penalise the professional craftsmen and to inhibit their ability to explore new forms and new types of work. At the same time it allows the perhaps less gifted recreational potter unfettered access to the market.

We do of course recognise that New Zealand's economic situation is serious and that the Government must look to ways to increase its income. However, the benefits of taxation revenue gained must be offset against the damaging losses which will occur if the present sales tax regulations remain in force.

To a large degree, our future economic wealth must depend on the effective utilisation of the talented and innovative people in our society. In common with other culture-based industries, potters use 100% New Zealand materials; produce goods with a high added value; and have demonstrated that great potential exists for the development of domestic and export markets for their work. To discourage this type of activity through punitive taxes makes no economic sense at all.

The Council has put these views to the Minister of Customs and the Minister for the Arts and prepared a submission to the Inter-departmental Committee which expands on these arguments. In particular the submission argues that the major issue facing the Committee is in fact far wider than its terms of reference. If the Government is in fact committed to a shift from direct to indirect taxation, this must be done comprehensively and involve both a proper review of the objectives and effects of this alteration in fiscal strategy. If this comprehensive review does not occur, inequitable and confused situations — like those now affecting craftsworkers — will inevitably continue to arise.

The Council has therefore made only two major recommendations to the committee:

a that the Government complete its policy review of the whole indirect/direct taxation switch as quickly as possible to overcome those future problems which will occur in the absence of such a review; and

b that in the interim, the Minister of Customs exercise his discretion and exempt all craftspersons on the grounds of the economic and cultural damage it is causing and the inequitable distortions resulting from the present sales tax policy.

Michael Volkerling
Director
Queen Elizabeth II
Arts Council of New Zealand

Government policy towards craft activities remains quite definitely one of positive encouragement. As well, however, it is Government policy to move towards indirect taxation to achieve a better balance between taxes on incomes and taxes on the sale of goods. Income taxes have been high by world standards and a considerable burden on families with average incomes, as well as a disincentive to effort. By casting the net of taxation more widely through the economy by increasing taxes on the sales of goods, these income taxes can be reduced.

It follows then that a wider range of goods will be subject to this form of taxation, and it would be difficult to treat a particular sector of the community as immune from that tax, especially when goods in that sector are sold commercially in competition with other similar goods that **are** subject to sales tax, as is the case with tableware.

The Government is, however, aware that anomalies can arise in this situation, and it is for this reason, together with the strong representations which have been made by the various crafts interests, that the interdepartmental committee has been set up to look at reconciling these and other related issues. The committee's terms of reference, which are available from the Customs Department, are designed to determine whether there are any means of accommodating at least some of the concerns expressed by crafts persons including, for example, the conditions under which craftspersons should be required to licence for sales tax purposes, the position of those engaged in non-commercial activities and any special circumstances peculiar to craft activities.

H. C. TEMPLETON
Minister of Customs

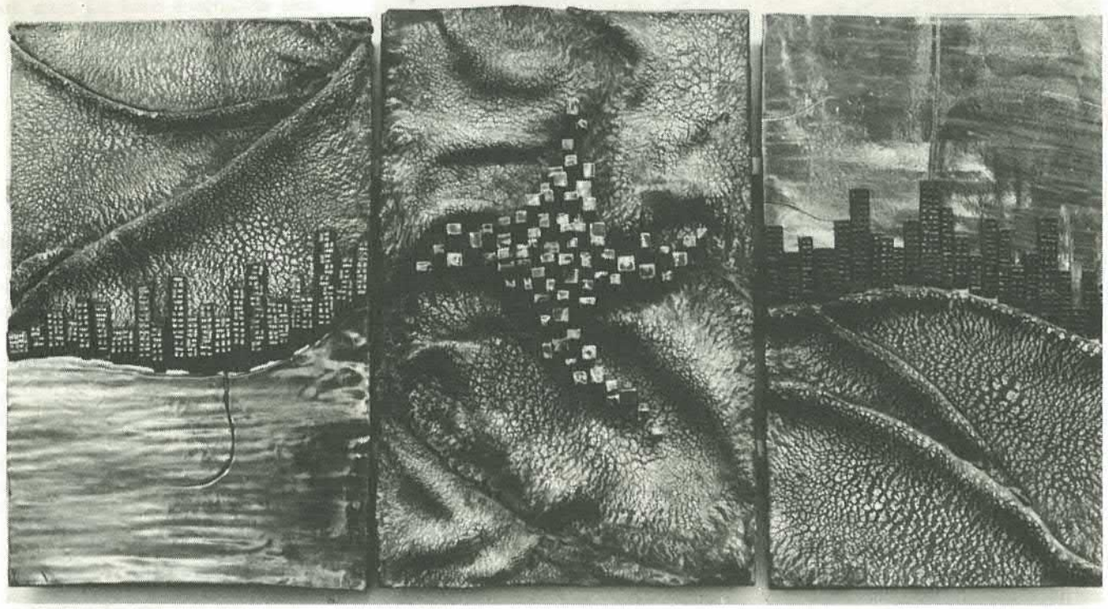
Patti Meads

Studio potter 10 years. Started at Wellington High School as an earthenware potter. Now works in stoneware and porcelain as well. Background of drama, writing and fashion. Member Wellington Potters Association and New Zealand Society of Potters.

"I'm influenced by textures I see around me, lichen and moss growth, seed pods and twisting vines, but I suppose because of my background, I like the juxtaposition of dramatic effects of combining natural clay with matt black or white. Using earthenware as a medium has given me scope to design lamp bases and articles which suit a contemporary decor. I also make decorated domestic ware.

"Over the past few years I've been working in all three mediums — earthenware, stoneware and porcelain. I haven't decided where to specialise. I enjoy it all. I like the contrast of producing work showing the strength of the clay, such as an earthenware wall panel, and the delicate porcelain goblet or the lustre trinket box.

"Everything I do leads to something else. There is always the challenge of being able to make something for which I have only a modest technical background."



Notes on firing with crystalline glazes

At present I'm finding working with crystalline glazes, with their incredible variance from firing to firing and shelf to shelf, absolutely fascinating. I have been experimenting with a cone 4 glaze with combinations of copper carbonate and cobalt carbonate. I have also tried manganese, nickel and iron singly and in combinations, but without great success.

Originally I used a stoneware body but now prefer a white clay body — but I'm still experimenting to find the best body for that temperature. I have had crystals up to 8 and 9 centimetres on flat surfaces, but so far have not had the same success on vertical surfaces. The thickness of the glaze may have something to do with this. I don't own a grinder and therefore prefer to leave the lower half of the pot with only a thin coating so that it doesn't run all over the shelf. I dip the lower half of the pot first in water then in glaze so that the layer is thin but even, then dip or double dip the top in glaze.

My kiln — an electric top loader — has a mixture of very old and very new elements and that also seems to affect the finishes I achieve. Recently, when the middle elements were on the point of burning out, I obtained spectacular crystals on the top shelves. Next, firing with new elements in that position, no good crystals developed at all.

The firing cycle is to go to 1180°C as quickly as possible (usually 7 hours), then switch back and take an hour over the next 10 degrees to 1190°C. I switch off and drop 40°C (to 1150°C) and hold for 2 to 3 hours, then off. On again about 1100°C for one hour then cool to 1000°C and hold for ½ an hour and follow the routine off/on each half hour until down to 890°C or 880°C. I'm finding huge variations in crystal formation from shelf to shelf, so I haven't found all the answers yet.

Patti Meads

Work shown at the NZ Academy exhibition in Wellington in July.

photos: Evening Post

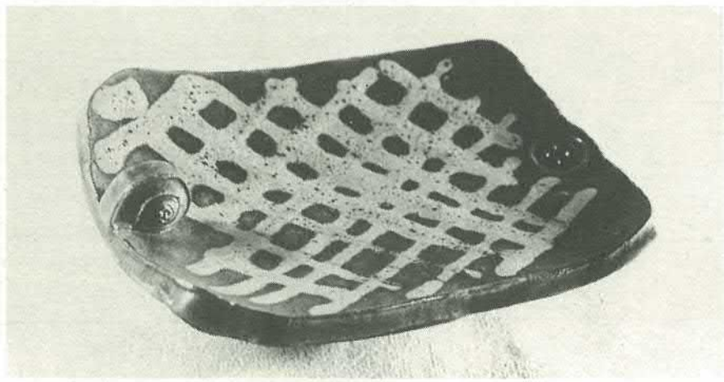
BEN WOOLLCOMBE

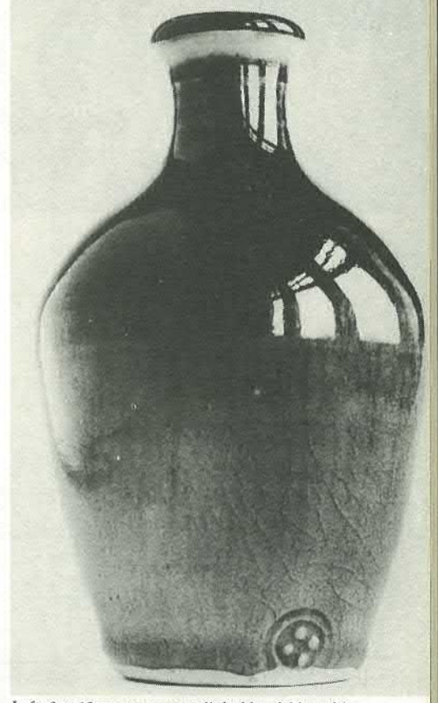
I first became interested in pottery when I moved to Waiheke Island in 1973. The work of my neighbour, Dennis O'Connor, inspired me to start potting. To begin with I designed and built a down-draught diesel kiln of demolition bricks and a thick coating of local clay. When finished the kiln looked like a well baked loaf of bread. To my joy and surprise it worked first time. This and a salt kiln built later served me until I moved to the East Coast two years afterwards.

I spent several years on the East Coast and worked for a short while at Helen Mason's pottery at Tokomaru Bay.

Now I have settled in Wellington where I work with a 2 cubic foot electric kiln. In my present circumstances with the small kiln and limited workshop space, I'm restricted to small pieces. I throw porcelain (Podmore's) and stoneware pieces fired to 1300°C. These small articles being held in the hand require considerable concentration in both decorating and making. I enjoy this type of work which is predominant in my output. Lately I have been hand building porcelain slab-ware. These simple and delicate pieces are completely vulnerable and require a sensitive touch which contrasts with the direct handling of the thrown work.

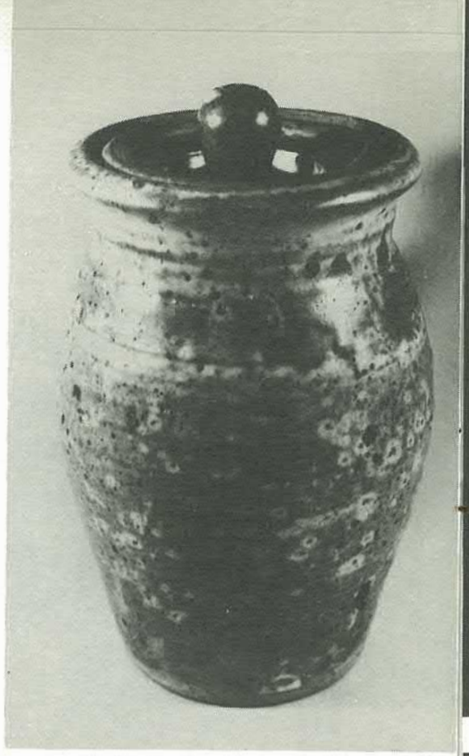
Ben pots full time in surprisingly rural surroundings for suburban Wadestown. He became committed to making pots during the third year of the industrial design course at Wellington Polytechnic.





Left: 9 x 12cm stoneware, light blue feldspathic glaze with brown slip trailed.

Above: Porcelain 12 x 5cm feldspathic glaze celadon, sprayed from above with cobalt and chrome oxides.

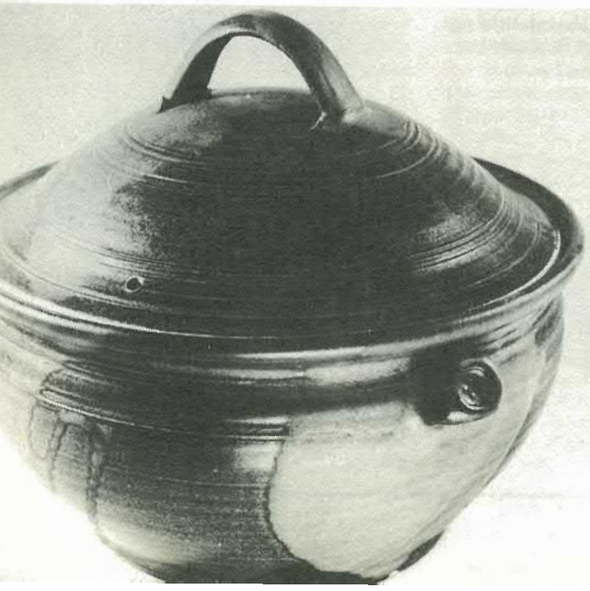


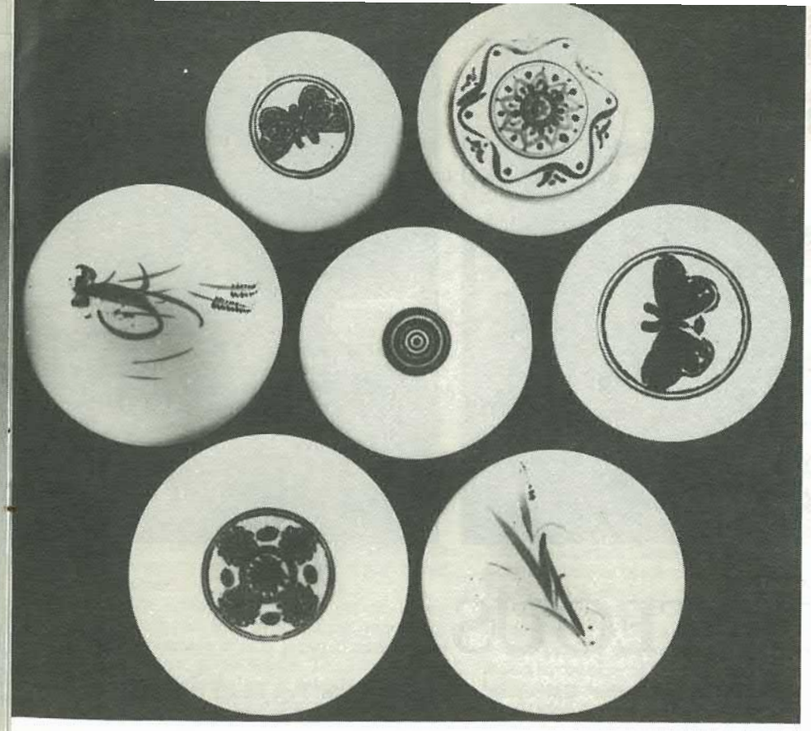
Left: Stoneware mugs, cobalt blue manganese decoration, white inside and waxy white with manganese and iron decoration.

Right: Stoneware jar 20 x 12cm Shino glaze.

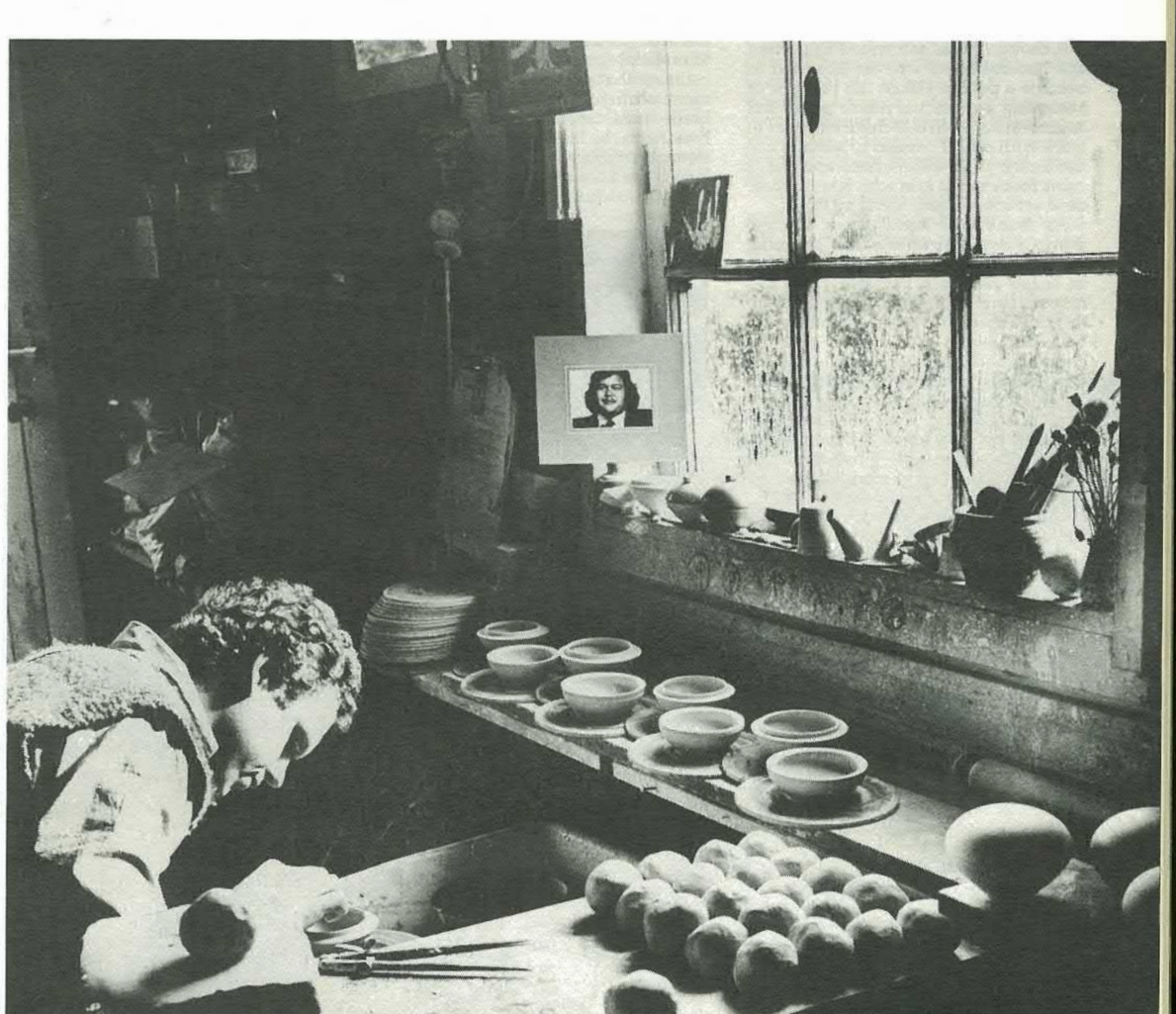
Below: Stoneware casserole 35 x 28cm, white inside, cobalt blue glaze poured over outside. Bowls white inside, cobalt blue outside.

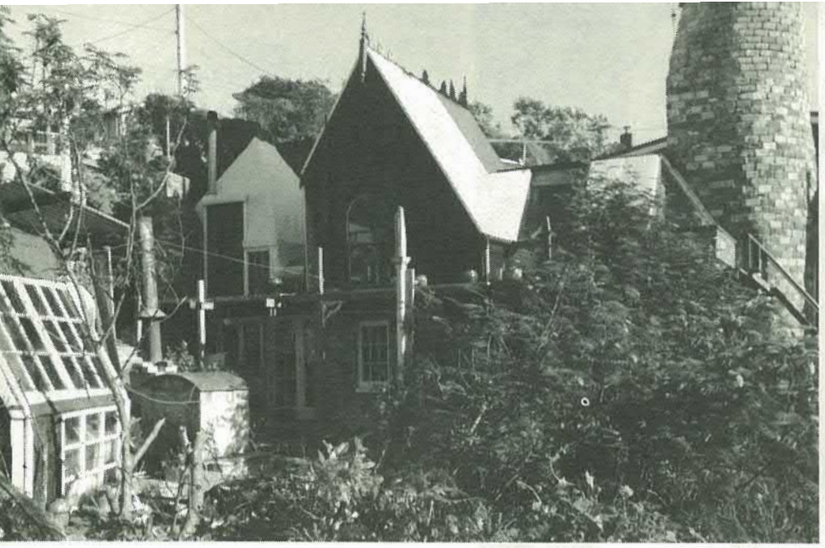
photos: Ben Woollcombe

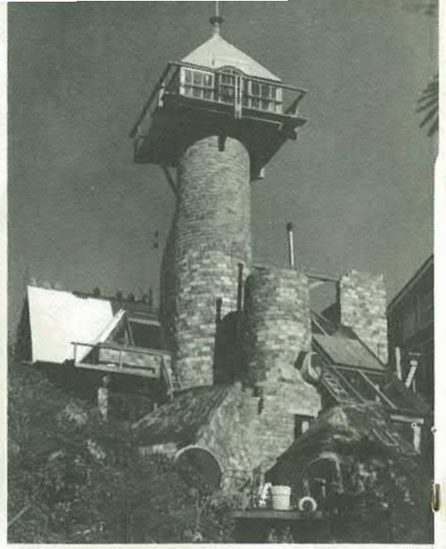




Collection of porcelain boxes 7 x 9cm diam., waxy white with cobalt blue decoration.







NEVILLE PORTEOUS

Production potter, workshop at Petone. Self taught. Former schoolteacher (art specialist), double bass player. Potting started through building his own house (designed by architect Ian Athfield) with demolition materials. Bricks were also available for kilns.

Although I was interested in pottery and had collected, I never intended to become a potter. I liked the thought of becoming a musician much more. But as art teacher with 600 children eager to work with clay, I needed to learn to use the Leach type kick wheel and the 2 cubic foot electric kiln which were standard art room equipment in 1970.

As many will know there are few things more distracting than a young would-be potter completing a painting in three minutes flat and then demonstrating some fancy footwork on the kick wheel. It wasn't long before we had clay, books and advice, and the children and I set out together to accomplish as much as we could. I soon became adept while standing on one foot and kicking with the other, at rescuing pots that had got themselves into all sorts of trouble. I had to be fast because in one art period wheelwork was restricted to a small number of kids. (I still stand most of the time when I'm throwing pots.)

Concurrently with these discoveries, Gill and I were building our house. The idea of building it ourselves arose when we learned there were thousands of beautiful bricks from the demolition of the Miramar brickworks going for only the cost of delivery. The search for suitable land to build a house out of bricks was frantic and by the time we had our steep ¾-acre block — that had been on the market for 14 years — the bricks had been dumped on the tip. However the friendly tipman helped us recover 21,000 bricks and we became regular tip urchins and were continually amazed at the range of potentially recyclable goods being dumped. The remaining 25,000 bricks we obtained from the Carterton brickworks following the demolition of the kiln there.

photos: Tony Athfield

Demolition was the dominant "progress" orientated activity of the day with one in twenty Wellington houses being demolished to make way for the "beautiful new motorway": some were notable houses such as Katherine Mansfield's home in Tinakori Road. We estimate that we could have secured almost sufficient materials, including baths and sinks, to build a house a day. Even with the little we did get we had a storage problem. The lanolin soaked Jarrah used throughout the house was from the carding room of the old Petone Woollen Mills. Just about everything, locks, light switches, etc., were demolition materials.

The house is built on a series of five hand-excavated levels. The bricks form a skin over the reinforced concrete structure. Although we had a lot of help from our friends we built most of it ourselves, brick by brick, in the evenings and at weekends. It was a shock statement as it took shape, but we tried to remain sensitive to the materials and the environment and to create something that was not only unique but also **real** — not an over-iced birthday cake as conversions in Parnell Village have become.

With so much material at our disposal we were naturally led into kiln building at home. The advent of natural gas meant that the Miramar gasworks got the nod and we obtained a truckload of straight and shaped firebricks for the first of our four kilns. Kilns 1 and 2 were up-draught and beehive shaped, their diameter determined by the shaped bricks with their corbelled domes and firebox arches. I bought a primitive home-made single-speed electric wheel and using clay dug from Ohariu Valley and Pahautanui, started throwing pots. The first kilns were 40 cubic foot top loaders. The pots were lowered in on ropes and piled on top of one another. We were the greatest shard producers in the Southern Hemisphere. Sometimes we unloaded the kiln with buckets often having to bash pots free from fused clusters.

We knew little about wood firing techniques but decided on wood for fuel because it was around and would otherwise go to waste. Truckloads of it were available for a telephone call to Bob Vince, Wellington's most helpful demolition man who is now our friend.

Numbers of people contributed to the firing in those days and since firings sometimes went on for 20 hours, they were friendly social events. My brother Wayne caught the bug and set up in Taupo making wood-fired flowerpots.

It wasn't until we built the third kiln, which was down-draught and had a 4 foot 6 inch corbelled arch firebox, that we began to have much real control over the firing. We mostly made flowerpots because we couldn't afford shelves for the kiln and because they provided such good throwing practice and made excellent vehicles for all sorts of experiments. We loaded them with coarse grog and sometimes sand from the stream that crosses the property, and used a variety of slips and engobes, including a red slip which we mixed from a red clay dug at Pahautanui. In those days the outlay for materials was negligible, the pots were made for fun, but then we realised that there was a demand for these distorted and flashed pots we began buying prepared clay from Winstone's at $80 a ton and increasing production. Winstone's clay, with its high crushed rock content and open texture, proved ideal in a wood-fired kiln — resistant as it is to thermal shock. This clay is raw glazed readily and benefits from the wood flame more than any other clay we tried.

When we began to sell pots seriously, Gill did more than her share of work, firing the kiln each day, decorating the pots, joining pots into clusters and helping at the stall at Victoria Market. Our aim was to fire the pots to achieve black core reduction, to get as much flashing and benefit from the flame as possible and be smoke free in deference to the neighbours.

Our pricing policy was related not so much to the size of the pot, but rather to what we considered to be the soul and quality of the pot. In addition to the multitude of flowerpots, I made and Gill assembled, bells, trumpets, cluster pots, people pots, etc.

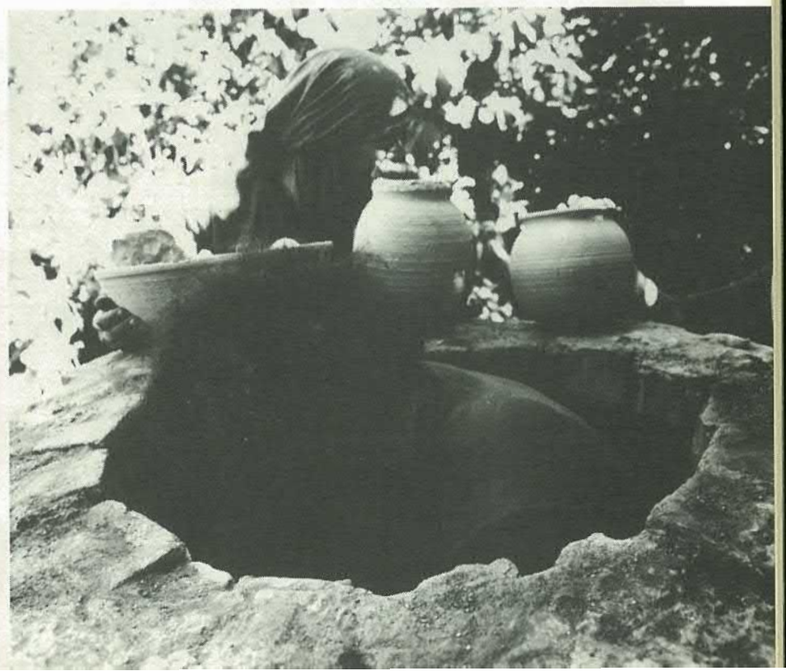
After re-rooting the bagwall through the middle of the kiln, we went into earthy domestic ware; pots with raw glazed interiors placed on silica sand laden shelves and exposed to the full fury of the flames.

The demand grew and hours required for building diminished. Bob Bowket, wholesaler of ceramic supplies, offered me an electric kiln and a workshop on a lease basis with the hope that we would export bisque flowerpots to Australia. We accepted in 1978 and Gill and I were pleased to get the pottery production away from the house. But at first the venture was disappointing. The pots were bland, I found it difficult to discipline my throwing to uniform production and costs were such that we didn't have a hope of competing with flowerpots produced in countries such as the Philippines who were supplying to Australian wholesalers at prices little above our production costs. We sold our stockpile locally and began a series of experiments and did some market research to decide on a new direction. Initial trials to produce earthy, imitation reduction fired stoneware were a failure. It wasn't until we realised we should exploit the advantages of the clean oxidising atmosphere of the electric kiln, that things began to go really well.

A big challenge came when Leslie and Neil Harrap asked me to make a range of pottery for their new Mt Cook Cafe. Possessed as I am with an ambitious mind that often overleaps the limitations of my body, I accepted this demanding job.

After samples had been made and discussed, we decided on the items and forms and I began work using a 4-1 GB2/E1 blend, Nelson clays, which I fired to 1280°C with one hour soak. Gill sprayed all the raw pots using HM Oatmeal glaze applied over heavy manganese-laden slip decoration. To keep the amount of work and the price down, I determined to throw the three sizes of small bowls and the cups off the hump. This I had seen Japanese potter Kenji Kato do so effortlessly, and although I am now adept at throwing from the hump, the cafe bowls and cups were done at least three times over before I had them to an acceptable standard.

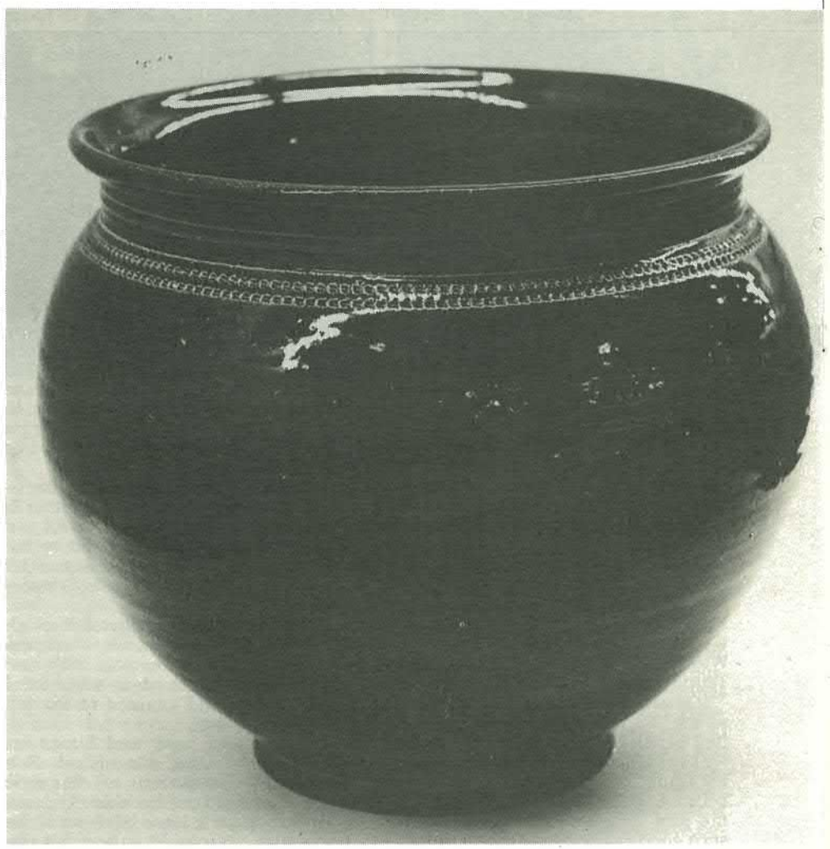
Getting the correct size was the main problem, but I also had other problems like "S" cracks on the bases of the pots, which subsequently I learnt could be avoided by throwing at right angles to the kneeded grain of the clay. I did away with leather-hard turning by using a

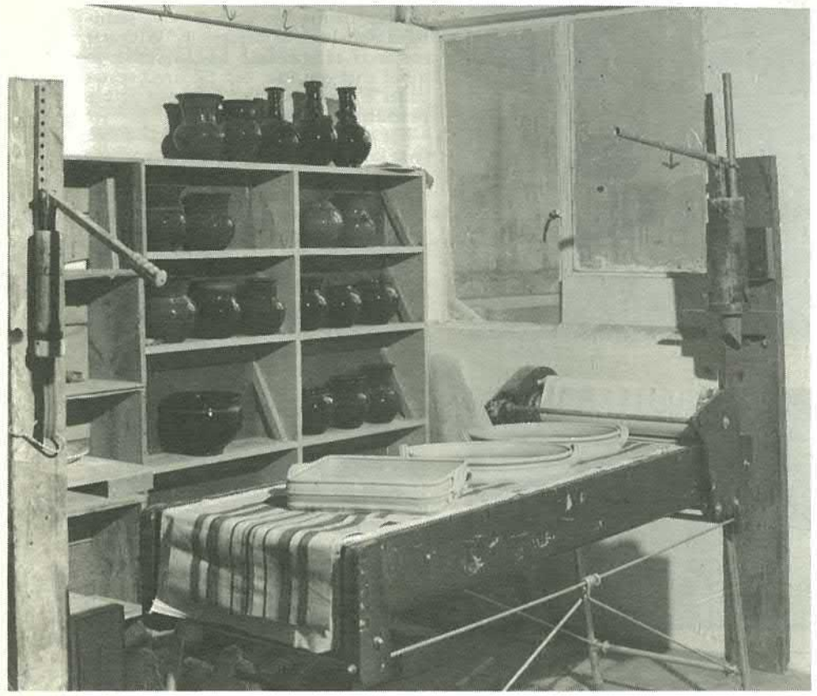


boxwood tool with a concave end to make the footrings as the pots were thrown. (I do this with all my flowerpots now.) I threw lids off the hump, and extruded the handles for all the cups, jugs, teapots and casseroles required for the cafe with a Cortex 2" extruder. Extruded handles are quick and easy to apply and have proved to be strong in use.

Making the pottery ware for the cafe taught me a lot in a short time. As I became more skillful at making the range, the forms became more refined and now, as I look back on the early pieces, I can see where they could be improved. With crockery in constant hard use, the original clay body was not as chip resistant as we wanted. I now make replacements with Harrison Mayer buff modelling clay which I fire outside the manufacturer's recommended range at 1240°C. Although more difficult to throw, this is a marvellously well behaved clay in an oxidation atmosphere, raw glazing readily and producing a strong, durable body.

Most of our production over the last two years, however, has been in earthenware glazed flowerpots and jardinieres which we have produced efficiently. The flowerpots are made reasonably quickly. I throw 20 or more 3lb flowerpots in an hour. They are made in sizes 1½, 3, 6, 12, 24lbs, the sizes chosen so that they can be fired one inside the other in groups of 2, 3, 4, etc., depending on the current demand. They are supported on prop bases and stilts. Early on we had problems associated with the raw glazing, stacking and fast firing cycle. Our proportion of "seconds" still hovers between 10-15%





photos: Tony Athfield

but this is due to general accidents of production rather than faults in procedure.

For clay preparation I have a geared down ribbon blender (cap 100lb), a commercial dough mixer (cap 12lb), and a light Talisman pugmill. By using this equipment I've increased my output by 20%. Most of the flowerpots are made from a 4-2 blend of the local pipe clay, Ceraclay and E1.

In direct contrast to the wood fired pots where the aim was to produce rich, earthy textures, I now want to produce vital shiny, colourful pots. We aim for a satisfying combination of form, colour and functional suitability at a reasonable price.

There is a never-ending search for different and exciting glazes. At present we are experimenting with turquoise and Egyptian blue colours using an alkaline base glaze. So far we have been frustrated in our attempts to achieve good artificial reduction copper red. One of my favourite glazes from our range we call Denim Blue. This is it:

Electric kiln oxidation

soda feldspar	120g
zinc oxide	60g
alkaline frit	120g
standard Borax frit	120g
silica	30g
whiting	30g
china clay	60g
cobalt oxide	8g

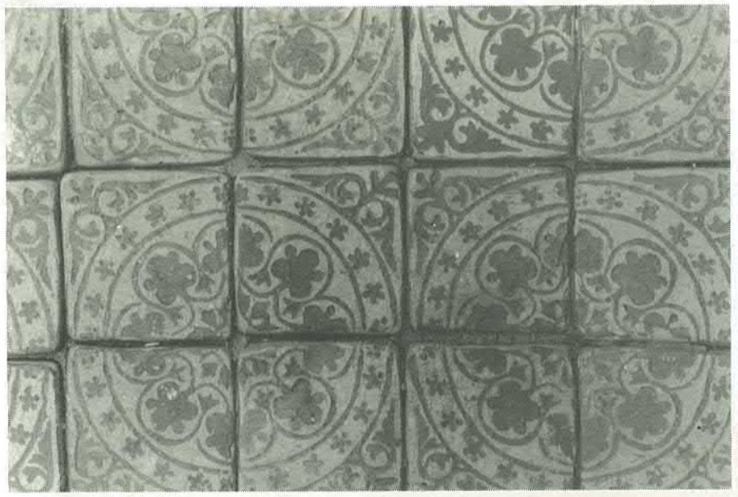
fired to 1180°C.

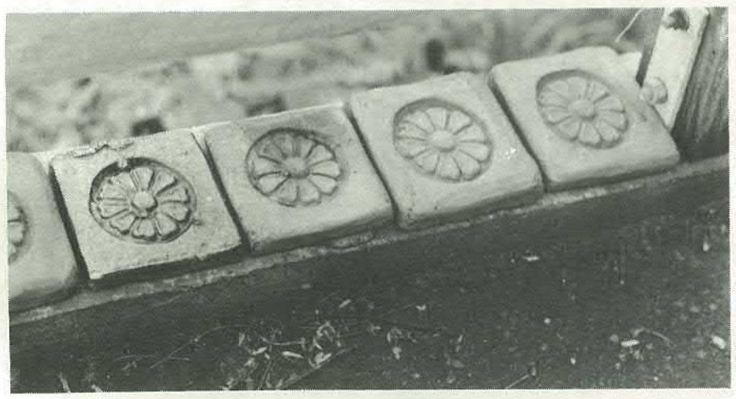
Pots are raw glazed by spraying after a coating of white engobes or slips. We always take care to thoroughly dry the next day's firing on top of the kiln, so the pots are bone dry when glazed. Most of the shrinkage — a distressing 18% for our pots — has then taken place and we need make no adjustment to our glazes to allow for body shrinkage. The pots are a little stronger when dry than leather hard, and by keeping the water content of the glaze down, we lose very few pots during glaze application.

We have had all sorts of hassles with different spray guns. The best results have been with auto putty guns (used in car assembly) with internal mix nozzles and 30lb pressure. With this gear we can spray a 12lb pot in 10 seconds.

I am now working a piece basis scheme with the supply firm; a scheme we devised to enable me to devote more time to experiments. Alex Hayes does the glazing and firing and the firm sells the pots. I charge at a rate varying between one third and one fifth of the wholesale value of the pots. The kiln is now utilised more efficiently. Before this new arrangement, mainly because of rapidly rising costs, I was having to spend more and more hours at the pottery. More recently there has been the 10% production surcharge (the recent sales tax) which for any one-man band operating a 50% expenses, 50% labour and profit basis must be felt as a 20% drop in income.

The kiln is a 12.5 cubic feet South Pacific, recently rebuilt by Brent Russell and enlarged by replacing the Perlite





backup insulation with 2 × 1" semi-rigid fibre batts of 8lb density. With our methods of stacking, and keeping in mind that our kiln can be fired seven times a week, we find we have ample production capacity.

For experiments we keep a 2 cubic foot kiln. The kiln is efficient and we utilise every scrap of heat for drying pots, space heating and warming lunches. We keep a blow torch handy to keep the elements in their grooves (we heat the element and drop it back in its channel). Cost per firing both kilns is around $7.

We are exporting a small percentage of our production to an Australian wholesaler — mainly cylindrical kitchen storage jars. The cost of freight and packing coupled with high markups of Australian wholesalers and retailers means that a pot leaving our hands at $2.50 sells for over $10 there. Our products are competing directly with those of the world's big pottery manufacturers such as Pearsons. We would like to see New Zealand craft shops established in, say, Sydney or Los Angeles, with somebody employed in New Zealand to co-ordinate and despatch small quantities of quality craft goods. A haphazard approach to exporting is doomed to failure. I believe that well-run shops would do well in markets of diverse consumer taste, and they would provide outlets for our potters and craftsmen.

A developing sideline is tile making. We started a collection back in the building days and incorporated them where possible into the house. We have encaustic tiles on the sitting-room floor from the old Lambton Quay Bank of New South Wales. Broken Victorian tiles make mosaic surrounds for drains and sumps in the brickwork. Gill has developed a technique for producing a type of encaustic tile by press moulding relief tiles and filling indentations with contrasting coloured slip. She also press-moulded relief garden tiles which we sold and used about the house.

A common passion for Victorian tiles brought Tony Athfield and me together for many hours over the last year to devise a way of reproducing them. It's been a labour of love rather than a necessity. We press-moulded tiles, we slip-cast them, we have screen printed commercial white tiles and we've worked with transferring negatives to decal paper. (Tony is a professional photographer.)

I have bought a Talisman slab roller and at last we have a range of tiles ready to market. The slab roller will also be used in conjuntion with a 4" extruder made for me by McLennan Engineering of Lower Hutt. The side of the baking dishes photographed were extruded, made possible by using U bolts to support the inner side of the die.

Neville is interested in hearing from anyone with similar production problems. He would also like to exchange house and workshop for a period with a North American potter. His address is 66 Ranui Crescent, Khandallah, Wellington. – Ed.

Raeburn Laird

Raeburn Laird is a part-time potter who lives in Lower Hutt, where the supply of natural gas is efficient and charged out at a lower rate than many places. She is an active member of Wellington Potters Association.

Working in the middle fire range of cone 4-6 as I do, I have never known whether my pots are high fired earthenware or low fired stoneware. At a recent lecture to Wellington potters, Dr Percival of N.Z. Pottery and Ceramic Research Association, said perhaps the definition of stoneware and earthenware should be one of porosity **not** temperature. Pottery taken to the full maturity of the clay would be termed stoneware and porous pottery earthenware. I like this theory as it is not only earthenware pots that leak.

Glazes up to cone 6 give me the best of two worlds, the subtle colours of stoneware and the brilliant colours of earthenware, with the more recent advantages of fuel savings.

For the last four years I have fired a catenary arch kiln by natural gas with an occasional glaze firing in my old electric kiln. One difficulty is blending two clays to mature successfully at 1200°C. Perhaps clay processors can give this thought as I am sure more potters, for fuel conservation, will turn to this temperature range.

GLAZE RECIPES FOR CONE 6

Matt white glaze – cone 6 (1200°C)

nepheline syenite	4lb 3oz
dolomite	10oz
china clay	8oz
flint	9oz
zinc oxide calcined	6oz
tin oxide	4oz

Variations

creamy yellow oxidised
light green reduced
add
3oz yellow ochre

pale blue
add
¼oz cobalt oxide

dark brown oxidised
tea dust type reduced
add
4oz red iron oxide
4oz black iron oxide
2oz manganese
omit tin from brown glaze

pale green oxidised
pinky peach reduced
add
2oz copper carbonate

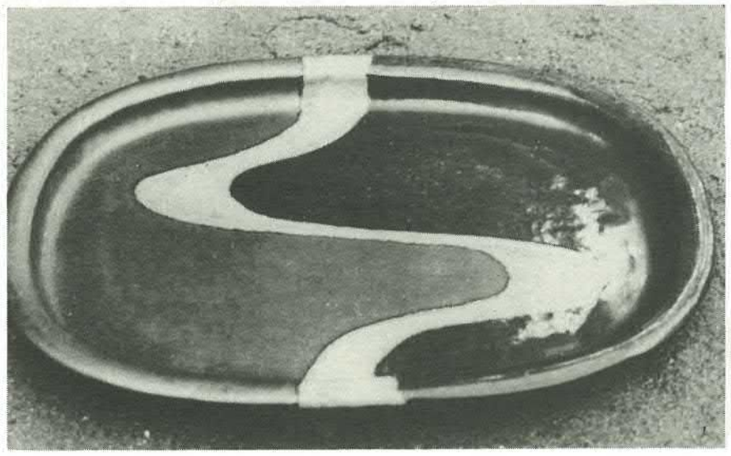
Raeburn Laird recommends the glazes compiled by Janet DeBoos in Glazes For Australian Potters *reviewed in last issue. – Ed.*

Paul Wotherspoon

Full-time potter (New Zealand Potter, Vol. 18/2). A high proportion of Paul's production is flatware which he sells to craftshops throughout the country. For many potters the prospect of packing and freighting long distance is daunting. Paul has developed an efficient system for air-freighting. He can take a firing out of the kiln, pack a hundred items and get it to the airways in an afternoon.

One of the problems of packing is getting boxes the right size. Since his clients are regular customers he has a supply of solid wooden boxes with the customer's name and address on one side of the lid and his own on the reverse side so they can be returned to him with the corrugated cardboard packing sleeves intact. The air-freight carrier collects from the customer and the return freight charge to Paul for the empty box is 50% less.

Potters thinking of selling to more distant markets would find the ANZ freight managers have helpful suggestions for quick carrying at reasonable cost and they will deliver from door to door. Paul's advice is to spend the time working out very carefully exactly what you need, and of course to work properly, you need regular consignments of similar orders.



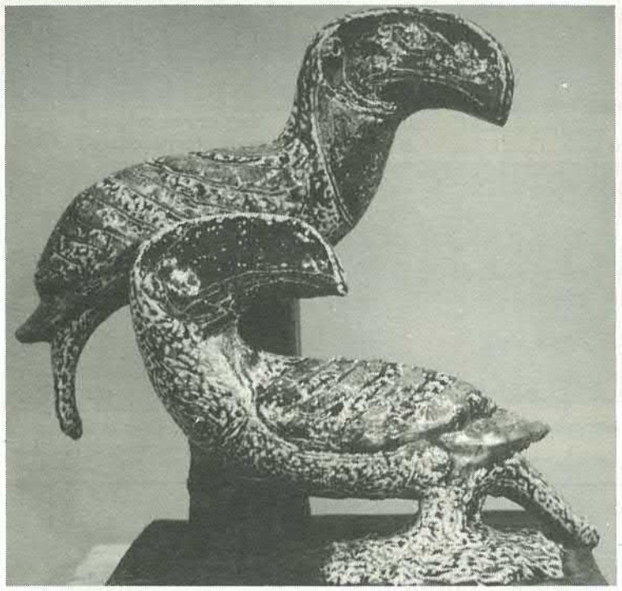
Laurie Lord

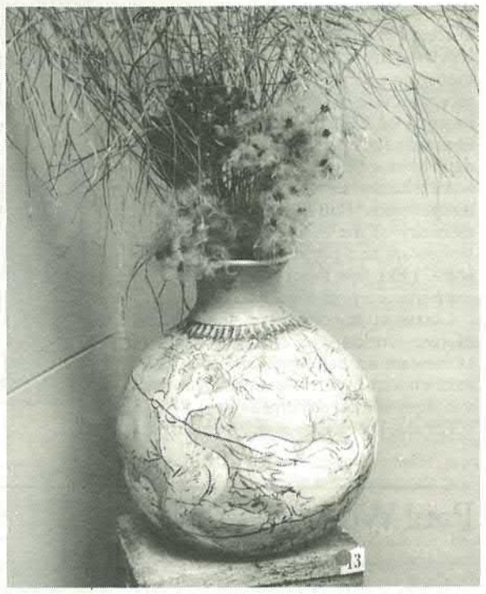
As Head of the Art Department at Wellington Teachers' College, Laurie Lord has not much time to spend at potting. He makes the College facilities available for lectures and demonstrations and is of great assistance to the Wellington Potters Association.

Below: pot 18 cm tenmoku glaze by Laurie Lord.

Muriel Moody and Jo Weissburg

Right: Pot by Muriel Moody and Jo Weissburg who held a joint exhibition at the Taj Gallery in Wellington. Porcelain clay with etched decoration. Left: Salt glazed Tucan, Muriel Moody.
Muriel Moody, early potter, sculptor and etcher, was first president of the New Zealand Society of Potters. Her studio and two kilns are at home in Days Bay, Eastbourne (Potter, Vol. 18/2).
Jo Weissburg has been a serious hobby potter for ten years. She has her workshop and kiln also at Days Bay. She makes domestic ware of an individual nature and decorative articles using slips for different textural effects. Fires with Muriel and others in the Wairarapa salt glaze kiln (Potter, Vol. 20/2).
Muriel and Jo combine their skills sometimes with Jo making the form and passing it on to Muriel for decoration. They have a compatible partnership which offers them both relaxed amusement and pleasure.

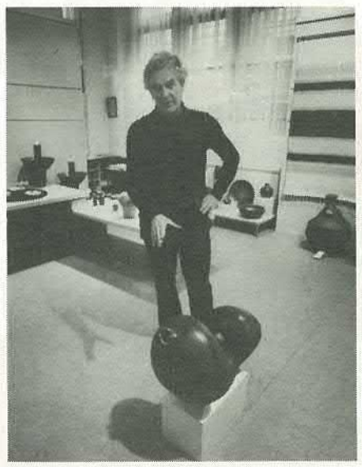




Members of the Wellington Potters Association who run country potteries, the Wrights, Davises and Mirek Smisek, will have their work shown in a subsequent issue.

New Vision Gallery, Auckland, celebrated twenty-one years with many regular exhibitors. Kees Hos came from Melbourne for the opening.

Platter, winejar and goblet by Peter Shearer. Irridescent peacock-blue glaze from rutile and copper. Shown at Alicat.



Publications

Pottery in Australia, twice yearly. $7 from 48 Burton Street, Darlinghurst NSW 2010.
Ceramic Review, six issues £6 from 17a Newburgh St, London.

Potters Doo 1979

This year it will be held at Warwick Lidgard's beach-backed farm property at Matarangi near Kouaotuna, over the Whangapoua Hill road from Coromandel. Same time, 7-14 January. It is to be hoped that this enjoyable potters gathering will continue at different venues.

correction

Steve Rumsey says there is an error in the Clark/Crum article published in the last issue (page 30). Water absorption (porosity) of the Rex Head Crum body is 3.51% (not 31.51%).

New members of New Zealand Society of Potters

There were 26 entrants, working predominantly in utilitarian stoneware, most showing competent technique, and an improving general standard and understanding of the medium. Six were accepted.

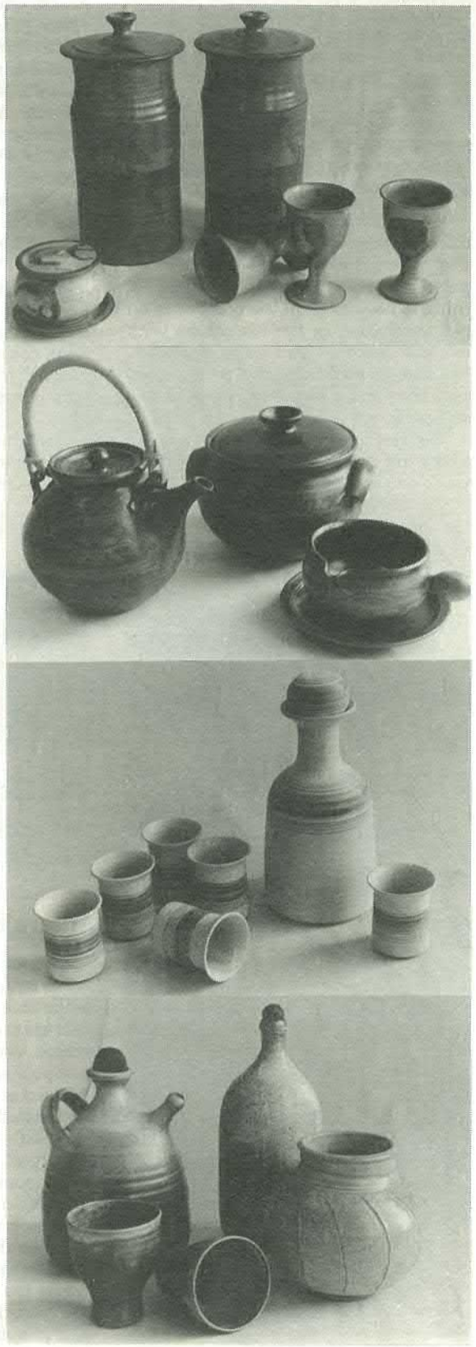
Overall, the functional forms and their appendages — spouts, knobs, handles — were better realised than in other years and the techniques well understood. There was a tendency for lids to be flat when a little lift would have helped the liveliness of the piece.

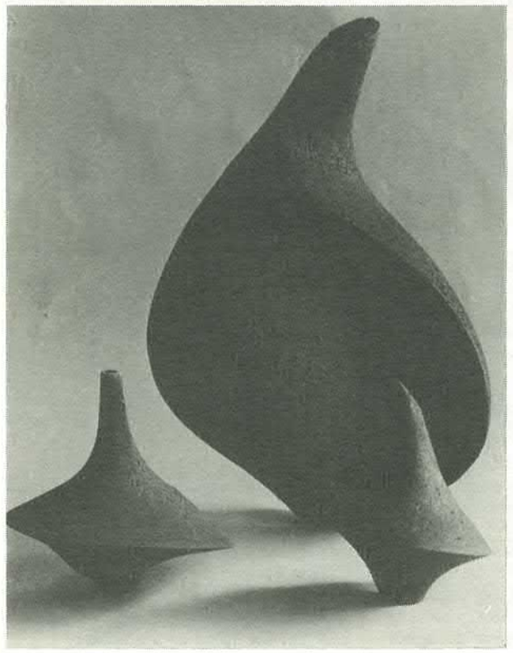
One of our main criticisms was the lack of vitality in the form and a deadness in glazing, much of which stems from the over-use of "safe" proprietary glazes. Often the glazes were confused by the admixture of several colours and textures and the decoration often crudely handled and unrelated to the form. Frequently several confusing decorative techniques were used on the same piece.

In the few examples of decorative ware there was a lack of certainty in the manipulation of forms and a tendency to excess of frills and sharp edges and decoration at odds with the basic form. There are exceptions where the forms are controlled and reveal a unity and a realisation of the potter's intention which makes them outstanding.

From left:
David Atkinson
Rick Rudd
Gerald Hope
Valerie McArthur
Sally Vinson
Richard Booker

photos: John Fuller





TWO EAST COAST POTTERS

Helen Mason

Pioneer potter working in Wellington from 1956 onwards. Editor New Zealand Potter *first nine years from which in 1956 the New Zealand Society of Potters was formed as a governing body to represent increasing numbers of potters and to increase standards. Foundation member Wellington Potters' Association. Helen's pioneering spirit continues. She has turned her back on suburban living as a personal protest to seek something more real.*

"I had developed a liking for living as close to the earth as possible during the war when my husband was taken a prisoner-of-war, and I felt the best thing to do was to sit the war out in an old farmhouse in the Wairarapa with my grandmother and baby daughter. We had no electricity but with a cow, pig, hens and a bicycle we were nearly self-sufficient.

"Fourteen years ago when the pattern of my life changed, I left Wellington to work out an alternative lifestyle incorporating the crafts. After a year in the Wairarapa to sort things out, I went to Auckland to join in a craft community which Jeff Scholes was forming in the Waitakere Ranges. This developed into an extended family for creative young people who did not fit into the system. Among the people who passed through there were Andrew van der Putten and Bronwynne Cornish. At this time Brown's Mill Crafts Market was established in Auckland city, and provided a useful outlet for our work.

After five years of this, for family reasons, I spent a couple of years as a village potter in Otane, Hawkes Bay, and then finally realised my aim of finding a house here on the East Coast. For some years I had been studying Maori culture as I felt that as a New Zealander I had to come to grips with something I did not understand in my own country. I also wanted to live among real craftsmen whose work sprang naturally from their hearts and lives.

They have taught me a lot and between us we have set up the two Tauira Craft Centres (Tauira means pattern), one where basically Maori crafts are taught and the other where we work mainly with wool. Up to now I have helped to keep the centres afloat by selling all my pottery there. I enjoy making domestic ware, mostly mugs, plates, bowls and casseroles. I also enjoy decorating them, which I do by putting a pattern directly on to the biscuit with glaze from a slip trailer, then dipping into a lighter or darker glaze. My patterns come sometimes from the Maori world in which I live, sometimes from nature. Every now and then I break out into free form slab work which I find a good way in which to express my feelings about this beautiful sea coast on which I live.

Up to now, I have been using a two-chamber down-draught kiln fired with two diesel Major S2 burners. I have just shifted to the old Harbourmaster's house at Waima, the other end of the Bay, and here I intend to build a small wood-fired kiln in the old stables next door. I think it is a good time to get back to the old exciting experimental days now that I have the National Super to give me bread and butter."

The value of crafts in society — Helen Mason

As I see it, the crafts are of immense value in keeping the community sane while this technological world literally falls to pieces over our heads. In an age where everything is plasticised and computerised, man needs to be reminded of his humanity. When TV was first introduced, sales of knitting wool boomed — people were fascinated by the "box", but at the same time wanted to do something with their hands so they could feel they were not completely wasting time.

The crafts take time, they are repetitive so that the mind has time to think while the body is working, and the soothing rhythm of the wheel in pottery and in spinning centres your thoughts and puts you in touch with the rhythm of the cosmos.

Other crafts, such as the Maori ones using flax, are a constructive way of working together and enjoying each other's company. Working in a group towards a common end is a very satisfying thing, at the end of the day you see something beautiful made out of raw materials you helped to gather, and when you use the resulting basket, something of the good fellowship remains in it.

This I think is why modern man responds so much to handcraft things — we all like using something in which we can feel the spirit of the maker.

Baye Riddell

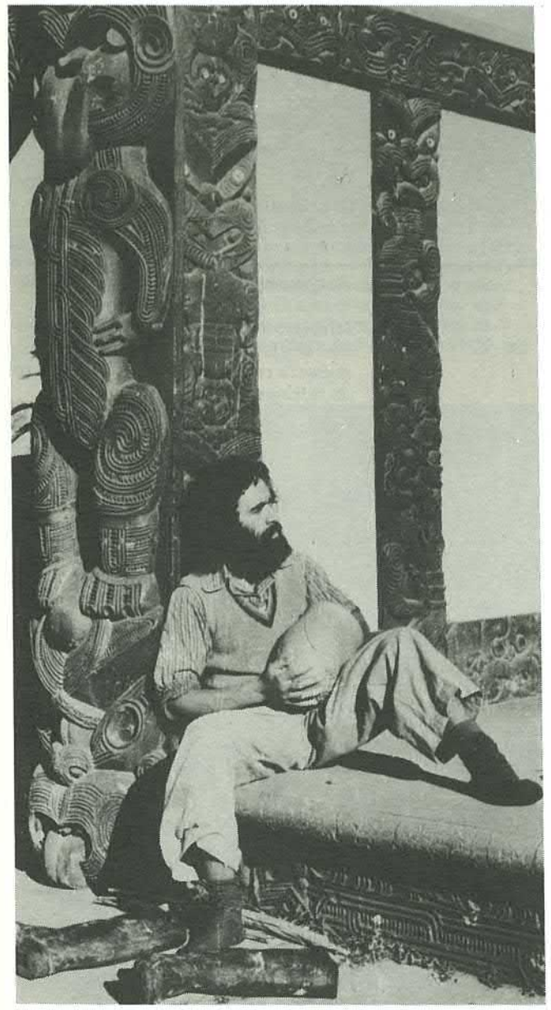
Independent potter five years. Started with Paul Fisher, otherwise self taught. After boarding school at St Stephens Maori Boys College went to Otago University intending to take a medical degree. Later when his Maori background was becoming increasingly important to him, pottery became a way of being self-employed on the land.

After baling out of university, I did stints at various things — selling encyclopaedia, freezing works, fibreglassing boats, retreading tyres, commercial photography, railways, screen-printing, advertising — until an acquaintance with Paul Fisher six years ago in Christchurch led me into the MUD. I had also begun to tire of the treadmill of urban materialism and felt the need to return to a simpler way of life (although at times it is far from being so!) — back to the East Coast and the Ngati Porou people. I saw pottery as a satisfying means of being employed back home.

From Christchurch we moved to Central Hawkes Bay where we spent two relatively uneventful years in limbo before buying an old shop at Tokomaru Bay (about 50 miles north-east of Gisborne) from which we sell most of my pots.

I make mainly domestic stoneware with the occasional excursion into earthenware planters and storage pots. I use prepared Nelson clay firing both chambers (about 60 cubic feet each) of my heap of firebrick to stoneware with oil — although, thank God, the Arabs are forcing me into local clays and wood. I raw-glaze, pre-heating for three hours or so with drip before changing jets. I enjoy the immediacy of some of the raw-glazing techniques. For example I brush local clay slips into the pot while throwing, then may further decorate with slip-trailing, brushwork, incision or sgraffito at leather-hard before a partial or full dip in glaze at bone-dry. I find this more relaxing than decorating and glazing a whole bisque firing all at once.

This area didn't initially appear to hold much promise for a stoneware body but recent tests by Harry Davis over a 100-mile radius have been encouraging. I am at present in the throes of converting some old stables into workshops with Helen Mason and building a larger kiln. My aim is for total use of local materials be it in stone or earthenware.



Baye Riddell outside the richly carved meeting house at Tokomaru Bay. His storage jar has a dolomite glaze with iron flashing. The plates have slip and wax resist decoration. Below: A weaver of flax baskets and kits in the traditional Maori manner. Nunu Karaumata Kingi.

photos: N. Harris

Rangimarie Hetet aged 15 with her sister.

Rangimarie, now aged 87, and her daughter, Digger Te Kanewa, have not only rescued a craft from oblivion, but extended its techniques.

Korowai weavers

Rangimarie Hetet
Digger Te Kanewa

an exhibition at the Waikato Art Museum
April 1979

The cloaks (Korowai), 17 in all are mostly in the possession of the artists. Each cloak represents four to six months work, this is four years out of the lives of these inspired and dedicated artists.

Of the time taken in Korowai weaving, two-thirds is spent in preparing the muka, flax fibre so finely wrought, bleached and prepared that it shines like silk and falls across the hand so softly that it seems miraculous that it came from the hard strong green erectness of standing flax.

To make a Korowai

1 Flax is cut and brought to house

2 The edge of flax blade and centre rib is stripped off and discarded leaving a length of flax approximately 11-12 mm wide. These lengths are sized

3 ***Whakapa***
A cut is made across the flax strip on the dull side at approximately the mid way point. This cut must not damage the fibre (muka)

4 ***Haara***
The green pith is removed from the fibre by scraping with a mussel shell from the whakapa. The shell is held against the flax. The flax has been turned over so the cut is underneath and the shell edge is on top. The shell is drawn down the flax about 30 mm. A length of pith separates from the flax strip and is grasped by a finger of the left hand, back against the flax. The downward stroke of the shell is completed, lifting off the pith. The flax strip is reversed end for end to clean off the pith on the other half and a few further strokes strip off residual pith

5 The flax fibre is divided and topped and tailed to even the thickness of the thread

6 ***Miro***
Flax fibre is divided into two portions. One end is held high in the left hand while the ends of the two portions are held, separated by about 30 mm, against the top of the thigh by the flat of the right hand. The right hand rolls the two separated portions of fibre over the knee onto the upper leg thereby twisting each portion into two strands. These two strands are then brought together and the hand draws back up over the knee onto the thigh once again, in the process twisting the two separate strands into a single warp thread (miro whenu)

7 The threads are washed and dried and put into hanks (whiri) of approximately one hundred. Some seven of these hanks are needed to complete a korowai

8 ***Patu muka***
The hanks are steeped in water and beaten to make them pliable. This is accomplished with a stone pounder on a stone anvil. The beating process must be so controlled that the pounder does not crush and break fibres against the anvil. The hanks are unravelled and then twisted into hanks once more.

9 ***Komuru***
The slightly damp hanks are then twisted and rubbed to further soften the fibre. As a result of this process the threads have a wavy character. This produces the necessary 700 or so warp threads for a korowai

Note
To produce the much thinner weft threads (aho) the same basic process is followed except that only four individual strands of fibre are twisted together to form this thread. Thrums (hukahuka – cloak decoration) are made in a similar manner but are tightly twisted. The corkscrewed thrums (karure) are three ply and the twisting process is reversed beginning down the leg, being drawn onto the thigh and down onto the leg again.

10 Feathers are graded for colour and size. Two are placed together, the stem being bound with soap

11 The weaving commences. The first weft thread, whakamata, binds all warp threads together utilising a double-pair interlocking weave. In this weave one pair of weft threads passes in front of the warp and one pair behind. The pairs then cross over, one passing between the two threads of the other, to pass on the opposite sides of the next warp thread. Feathers and thrums are woven in by the weft threads at spacings determined by the patterning. The cloak is woven over a simple frame consisting of two uprights and a crossbar

12 Decorations, feathers and thrums are woven in by the weft thread according to the pattern

13 Dyed threads are produced in the following manner.

Black
Hinau bark is bruised, boiled in water and left to cool. Threads are left to stand in the dye overnight. When dried they are a light brown. The blackness is induced by being immersed in a black, slimy mud (paru) overnight. The next morning the threads are removed, exposed to light for a time and then washed thoroughly in running water.

Yellow
The bark of the Raurekau tree is boiled. The threads are placed in the dye and when the desired colour is attained the threads are removed, washed and dried.

Brown
After boiling Tanekaha bark the threads stand in the cooled dye overnight. When taken from the dye the threads are rubbed in hot mahoe ashes then washed thoroughly. Dyed threads are used as decoration elements, as thrums and in taniko.

Digger Te Kanewa demonstrating at the Korowai weavers exhibition held at the Waikato Art Museum in April 1979.

photo: Kees Sprengers

Glaze materials
Do you use them safely?

AUTHORS

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The Major Hazard — Lead

In pottery making the classic example of toxicity is that of lead. Lead poisoning is caused by the ingestion of lead compounds into the system, either by mouth, by breathing vapours or dusts, or by getting the lead into open cuts in the skin. Although man, with respect to small quantities of lead, is essentially in balance with regard to his intake and output of lead, this balance may be upset by the continuous absorption of larger quantities of lead. This is dangerous because of the cumulative effect on the blood vessels, heart, kidneys, and nervous system. Symptoms include severe abdominal cramps, loss of appetite, fatigue, anaemia, etc.

Therefore the handling of lead compounds, especially raw lead compounds such as white lead and red lead, poses definite hazards. These compounds are relatively soluble and will easily dissolve in the acid gastric juices of the stomach and thereby set up lead poisoning. Fritted lead compounds are much less soluble but there is still need for caution. Merely melting glaze components to form a frit does not necessarily ensure that they have been rendered insoluble. The acid resistance of a frit, as with a fired glaze, is closely related to its chemical composition. For example, if boron compounds are fritted with lead, soluble lead borates are produced.

Then there are fumes from glazes during firing. All constituents of a glaze coating are volatile (i.e. vaporise) to some degree according to the temperature, the vapour pressure of each constituent, the duration of the heating and the atmosphere of the surrounding space. Above about 1200°C lead oxide becomes quite volatile. Even with fritted lead glazes lead will volatilise from the glaze and permeate the atmosphere within the kiln. Depending on the size of the kiln, and the quantity of ware being fired, the atmosphere around the kiln (assuming it is properly ventilated) can constitute a real health hazard.

Another hazard with lead is the possibility of lead release from a glaze on a finished article. Glazes are durable but they are not *totally* insoluble. Acids, for example, will extract lead from a glaze and this can be potentially harmful if a lead glaze is in contact with acidic foodstuffs. Acidic foods and beverages include fruit juices, soft drinks, wines, cider, coffee, all foods containing vinegar (such as salads, salad dressings, mustards, prickles), sauerkraut, cooked fruits, tomato products, and many others. A number of cases of lead poisoning traceable to excessive amounts of lead leached from lead glazed ceramic vessels have been observed in recent times, e.g., with drink prepared and stored in lead glazed jugs, and two cases were reported in New Zealand. Indeed the history of lead poisoning from ingestion from leaden or lead glazed vessels is thought to go back to Roman times.

It is standard practice in the dinnerware industry in many countries to measure the lead release from fired glazes by determining its acid resistance, or, more specifically, the ability of a given concentration of acid (usually an organic acid such as acetic — the vinegar acid) to extract lead from a sample under certain test conditions, i.e., an acid solution comparable in acid content to some acidic food is allowed to remain in a ceramic vessel under test for 24 hours at room temperature.

In New Zealand the food and drug regulations prohibit food vessels from being capable of imparting (rather than being free from) any lead above a specified level. These tests are carried out periodically by Chemistry Division, DSIR, for the Health Department to ensure that food containers on sale to the public comply with the high standards of safety required by the food and drug regulations.

It is worth pointing out at this stage that certain processing variables with the formulation, application and firing operations have major influences on the resultant acid resistance of a glaze. A lack of control over these can greatly increase the solubility (extractability) of lead.

The lead release characteristics of a given glaze cannot always be predicted from the chemical composition of that glaze. For example, lead release can be affected by all of the following factors:

1. Glaze formula, including opacifiers and colorants when used. Copper oxide is one colorant that can increase lead release from low temperature glazes. If it is added either as a stain or mill addition to any lead glaze it produces an uncontrollable and potentially hazardous increase in lead release. There is also recent evidence that in some glaze formulations chromium will also increase lead release from a base glaze.
2. The time and temperature of glaze firing. This refers to the heat input into the glazed article. Underfiring will increase lead release, especially from poorly formulated glazes, because the glaze constituents are not as likely to fully react with one another and with the body — with the possible result that a good acid-resistant glaze is not formed. Overfiring of course leads to excessive vapourisation of lead from a glaze.
3. Thickness of glaze application. A too heavy application may not allow the glaze to react with and dissolve sufficient body constituents that might be necessary to give a glaze a good acid resistance.
4. Kiln atmospheric conditions during firing. If lead glazes are fired in a kiln with a static atmosphere (i.e. a kiln without proper ventilation) a build up of lead fumes can cause a layer of lead to be deposited on the surface of the ware. Such deposits cannot chemically recombine with the glaze, and great variation in the lead release will frequently occur under these conditions. This is true even if it has been shown that the glaze would otherwise show lead release of less than the allowable limit when fired in a well ventilated kiln. Finally, lead glazes will not withstand reducing atmospheres in the kiln and must be fired with an excess of air. Lead oxide is easily reduced to the metal lead (which is readily leachable by acids).

You may ask why lead has been used so extensively in glazes in spite of the evidence of sporadic poisoning. Well, the reasons that lead has been so popular in glazes are the properties it gives to glazes. Some of the more important characteristics of glazes derived from their lead content include a low melting range, a wide fiing range, excellent smoothness, a high gloss, an excellent covering power, enhancement of colour, and a high level of acid resistance (when properly made). However, because of the problems of lead described earlier, craft potters are strongly advised not to use lead based glazes at all, but to find lead-free substitutes.

THE REMAINING PROBLEMS — OTHER HAZARDS

Handling of Raw Glaze Materials

The commonly used glaze oxides include the following:

Glaze Oxide	Materials Commonly Used to Supply Them
Na_2O Sodium Oxide	Albite (soda feldspar), soda ash — Na_2CO_3, BORAX, $NaNO_3$
K_2O Potassium Oxide	Orthoclase (potash feldspar), pearl ash — K_2CO_3, NITRE — KNO_3
CaO Calcium Oxide	Whiting — $CaCO_3$, DOLOMITE
MgO Magnesium Oxide	Magnesite — $MgCO_3$, DOLOMITE, TALC
BaO Barium Oxide	$BaCO_3$
Li_2O Lithium Oxide	Li_2CO_3, SPODUMENE, LEPIDOLITE
SrO Strontium Oxide	$SrCO_3$
Sb_2O_3 Antimony Oxide	Antimony trioxide
B_2O_3 Boric Oxide	Borax, boric acid, colemanite
ZnO Zinc Oxide	Zinc oxide
Al_2O_3 Aluminium Oxide	Feldspar, clay, $Al_2(OH)_6$
TiO_2 Titanium Oxide	Rutile
SiO_2 Silicon Dioxide	Feldspar, clay, flint

Silica (SiO_2/ NORMALLY FORMS THE MAIN BODY OF THE GLAZE. The oxides Na_2O to ZnO are the fluxes which cause the silica to melt at the desired temperature, depending on the type and proportion of flux additions made to the silica. The alumina has the effect of stiffening the melted glaze and prevents it from running down the vertical walls of pots.

The oxides listed above are the oxides which are used to form the glaze itself (the base glaze). Tin oxide (SnO_2/ AND ZIRCONIUM OXIDE (ZrO_2/ ARE COMMONLY USED AS OPACIFIERS. Generally speaking the "base glaze" oxides listed above do not give any colour to the glaze. Other oxides and compounds, such as those of iron, manganese, copper, chromium, nickel, vanadium, cobalt, cadmium, and selenium, etc., are glaze colorants which are usually added

in small percentages to the batch of glaze materials.

If the potter is preparing glazes from raw materials such as those in the table above, there are several hazards to be aware of. As well as lead, the compounds of barium, antimony, and zinc are in varying degrees toxic in nature. Most of the glaze colorants are "heavy" metal compounds and tend to be toxic, particularly cadmium.

It is not surprising therefore that all potters must be scrupulous in washing hands and take extreme care to avoid transferring glaze materials from the hands to the mouth. This applies especially to the handling of *any* toxic glaze materials. It means no eating, drinking, or smoking in the ceramic workshop area. Any spills of materials should be immediately damp-sponged and if any dust should appear it should be vacuumed thoroughly.

The source of spills and dust will normally be during the mixing and grinding processes. When mixing batches of dry materials respiratory protective equipment approved for use with toxic dusts should be used. It is a wise precaution to wear protective clothing but items such as long smocks should never be worn outside of the workshop, say in the home, where young children may come in contact with the clothing. Any kind of dust in a ceramic workshop is likely to be a health hazard and all operations which disperse dust such as grinding and mixing should be controlled by forced exhaust ventilation. If finely ground, free uncombined silica is continually taken into the lungs it will eventually lead to silicosis or potter's asthma, a very serious disease of the lungs.

Another hazard in handling glaze materials is that some soluble glaze materials such as pearl ash and soda ash are caustic and may injure the skin through burning unless rubber gloves are worn for protection.

One way of overcoming some of the above hazards is to make or obtain glazes or glaze components in the form of frits. One of the aims of premelting, i.e. fritting, glaze materials, is to make them less soluble in water. This ensures the homogeneous glaze coating remains on the surface of the ceramic body and that none penetrates the body, particularly in the case of porous types of body. Fritting is necessary to convert water-soluble glaze materials like borax, pearl ash, and nitre into relatively insoluble complex silicates and boro-silicates.

Of course many of the problems of preparing glazes from raw materials, or frits for that matter, can be overcome by purchasing glaze formulations ready made for application to ware. No particular handling problem is likely to occur in this instance. As a final warning in the handling of glaze materials it must be stressed that all glaze materials should be stored when not in use only in locked cabinets out of the reach of children. Young children should never be permitted to play in the ceramic workshop area. Young learners should always be supervised by a responsible person to avoid burns, spills, etc. Glaze materials should be regarded just as potentially harmful as chemicals in the household.

Glaze Application

The glaze is applied in the form of a finely ground suspension of the various ingredients in water, usually by painting, dipping, or spraying. If gloves are not worn when glazes are being dipped fingernails and hands should be thoroughly scrubbed with a fingernail brush upon finishing. In the case of spraying of glazes this should be done only in a well ventilated booth with an exhaust to the out-of-doors. Unless a fan in a spray booth is very efficient it is also wise for the operator to wear a dust mask to avoid the possibility of breathing glaze dust.

Fumes from Glazes During Firing

As was pointed out earlier in connection with lead glazes, glaze components will vaporise to various degrees. For example, chrome oxide is quite volatile at cone 6 or above whereas above cone 8 copper oxide is quite volatile. The kiln should not therefore be located in the kitchen, children's play room, or any other area where children or adults may unwittingly be exposed to potentially toxic fumes. The kiln should be fitted with a hood exhausting to the out-of-doors.

Toxic Metals Released from Glazed Ware

Glazes may be coloured, transparent, translucent, or opaque. Whatever their appearance, glazes are intended, when properly formulated, applied and fired to render the ware impermeable to liquids and insoluble in the usual acids and alkalis likely to be met in use.

Excessive lead release from glazed ware is the classical example but lead is not the only toxic metal that is potentially harmful in glazes. Indeed, lead free (or relatively lead free) glazes may contain other potentially toxic heavy metals and testing, as for lead release (see earlier description), should always be done for the solubility of these as well, e.g., cadmium, which is sometimes used to produce orange glazes or enamels or decorations, is even more toxic than lead and may also be extracted under the same acidic conditions when this metal is used. In some countries the release of other metals such zinc, antimony, and arsenic are also monitored.

The presence of heavy metal compounds in a glaze does not necessarily constitute by itself a hazardous situation. The real factor of importance is how resistant to attack by food acids the glaze may be. Indeed with properly formulated, applied, and fired glazes the leachable amounts of these metals can be very small (parts per million or less). However, from the foregoing it is obvious that careful control is required in the use of toxic metal containing glazes. Research is still going on to develop further sound data on the formulation and firing conditions needed to minimise toxic metal release from glazes.

What can the hobby or craft potter do to minimise the dangers of toxic metal release from glazed articles, particularly those for food and beverage use?

A. Avoid all use of lead-containing glazes. This normally requires the use of the high firing technique for stoneware at temperatures above about 1200° C.
B. Avoid using glazes containing cadmium, antimony, or other particularly toxic metals on food and beverage contact surfaces.
C. Design and fire purely decorative pieces only. Untrained people and beginning students should be discouraged from making glazes articles intended for food or beverage use.

In the final analysis, the potter should use only tested glazes for application on food and beverage containers — and be sure that the manufacturer's label clearly states the glaze is suitable for food contact surfaces when fired according to instructions. The glaze suppliers should know the chemical composition of every glaze they sell — local or imported. For the potter making his own glaze he should not use them on food and beverage surfaces unless he tests them first for toxic metal release.

Even after firing if there is any doubt about glazed ware for foodstuffs and beverages the glaze on the ware should be tested for compliance with the food and drug regulations.

"Games Potters Play" Exhibition at Alicat Gallery attracted satirical comment on the tax question: Gone Bust, Don and Andrew Auchinvole (6in high); Seven Deadly Sins, snakes and ladders game, in porcelain, by Micheal Lucas and Jill Totty (the Prime Minister is depicted as the eighth sin); a combination of tapeworm and python, scrub tax not backs, by Sandra Homer.

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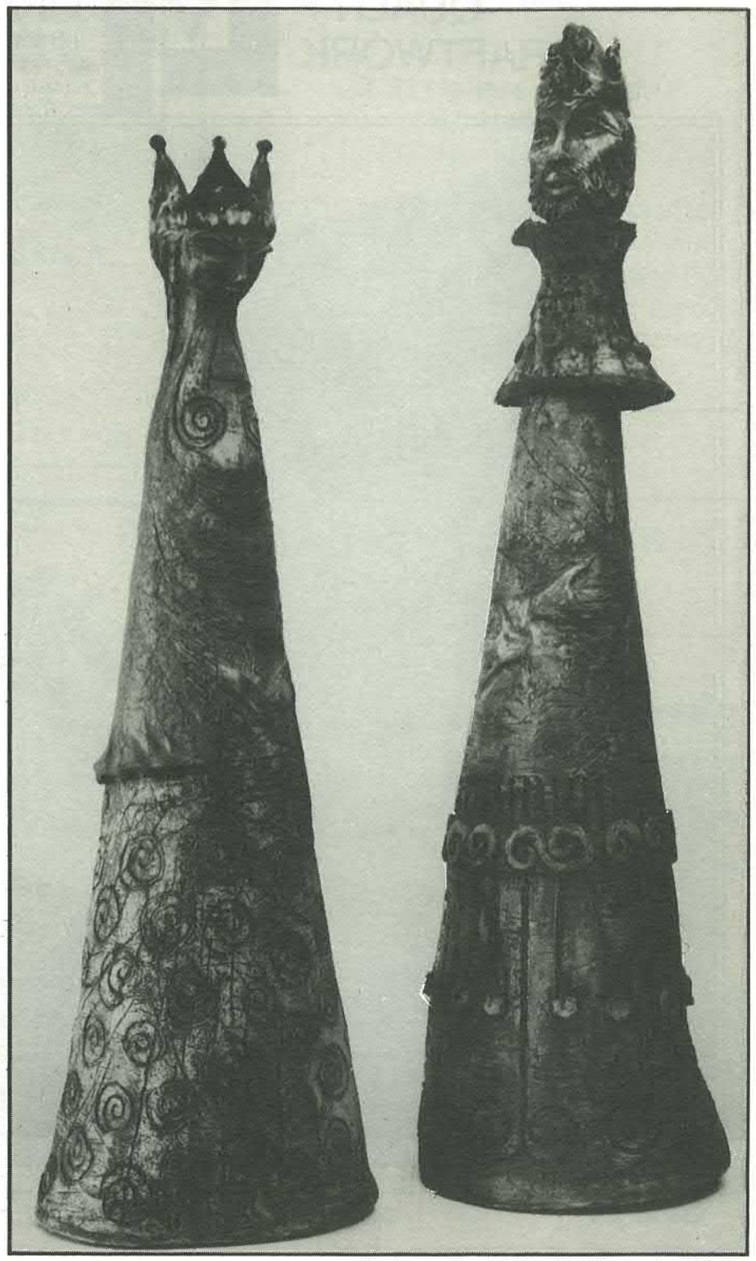

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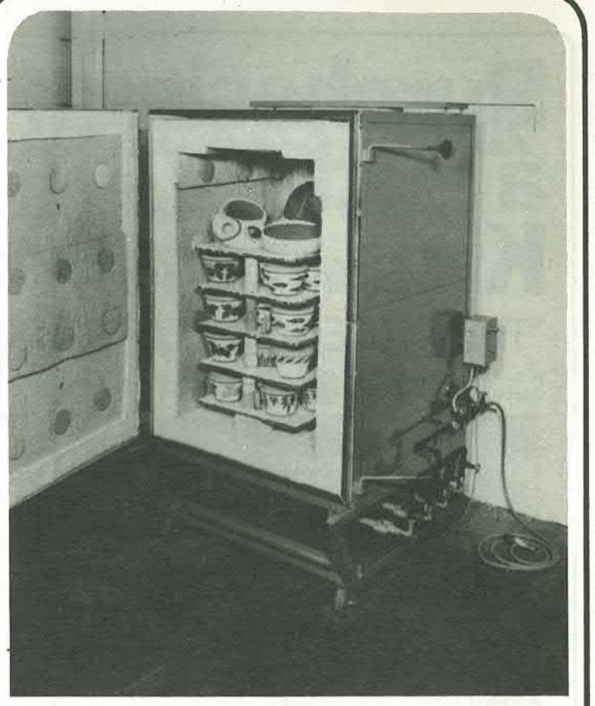

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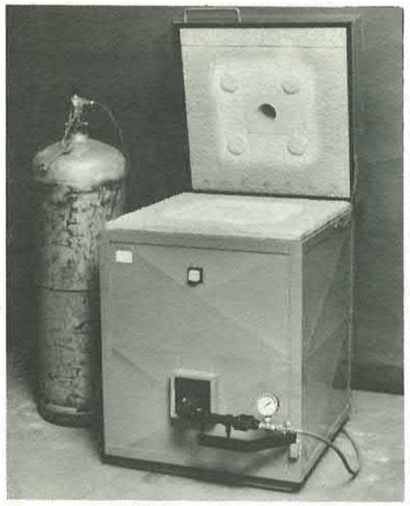

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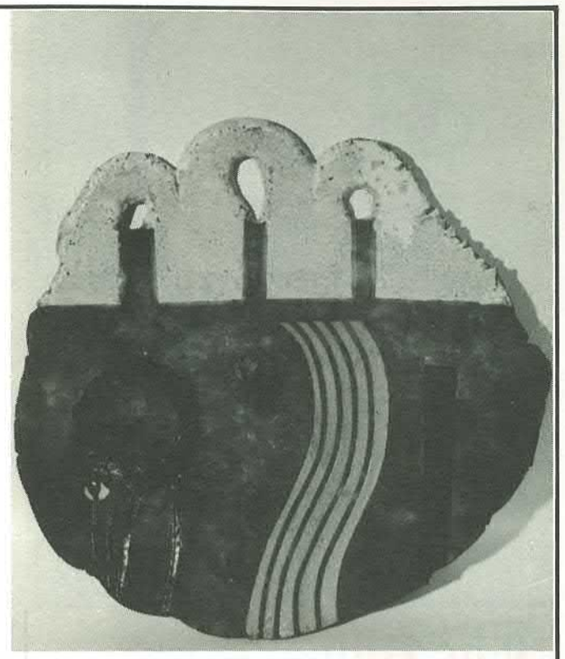

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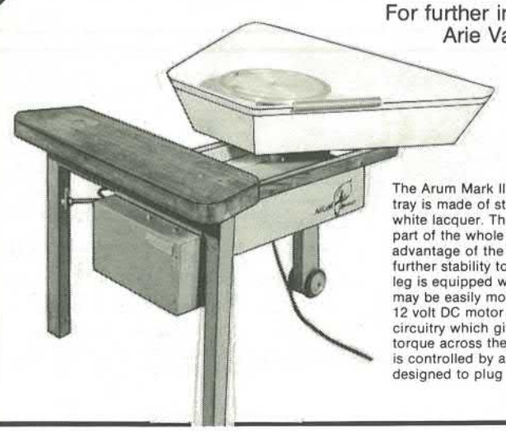

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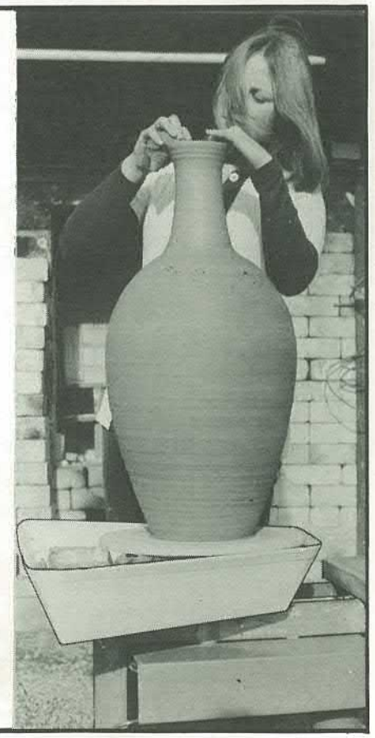

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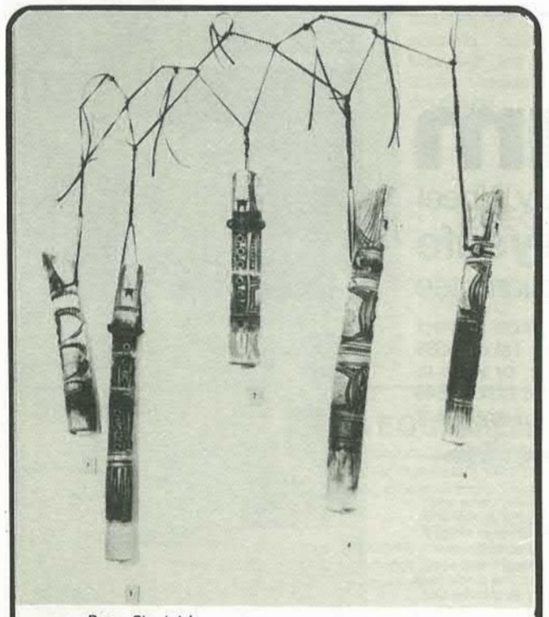

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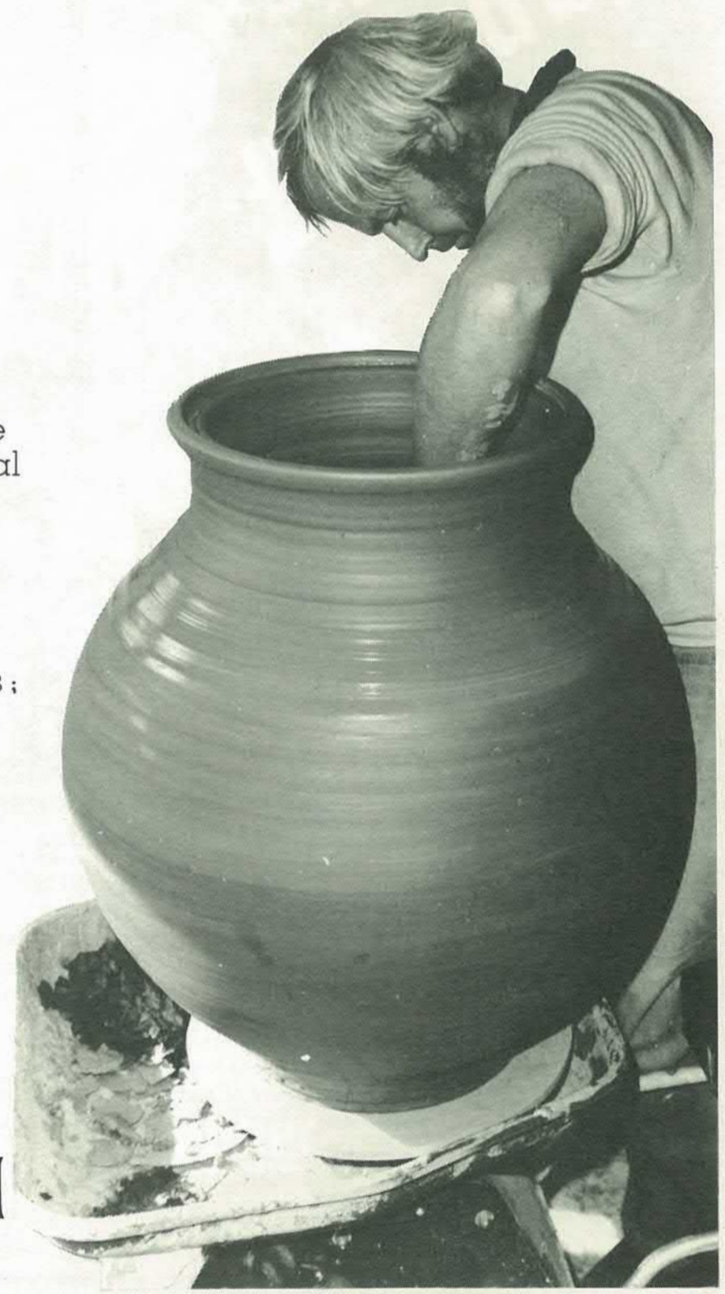

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