new zealand potter vol 22/2 spring 1980

potter

Cover
Raku bowl, Debbie Pointon's winning entry in this years Fletcher Brownbuilt Potters Award.
photo: Hill Photography.

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Potter

Contents

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Over the mountain to WAIRARAPA

Three potters living in the country in Southern Wairarapa. All have individual approaches to the philosophy of their work. Paul Melser's potting career began when he was a boy at school. Jim Greig too is a long established potter. Iain Crichton is a later arrival to the district.

Paul Melser — I see myself as a country potter

Apart from the farming we do on the 23 acres here, I try to keep the pots and pottery technology as simple as possible. I have enough space to make pots for two or three months before having to fire. After a session of making, the three kilns (an oil fired stoneware, an oil fired salt and a wood fired salt), are fired as often as possible. We sometimes unpack five firings a week and fire continuously until finishing. I only make pots when we need income. When not potting we farm or do maintenance work. This winter 6000 pines will be planted on an acre (at roughly 2 ft spacing). These are intended to be cropped for fuel in about five years. Pruned and fertilised they should provide 20-30 ft poles about 100 of which will be needed for a firing. It may be possible to produced our own fuel requirements on a very small area.

All the clay is blended here. Although I sometimes buy prepared clay — maybe two tonnes a year — it is used only as a constituent to compensate for deficiencies in our local clays. The three tonnes of clay used each session takes about a week to dig and prepare. The composition of the clay depends on the pots I want to make. Usually there are four clays — for big pots, planters, fine domestic ware and casseroles — the constituents will vary from session to session.

Glazes are simple, being generally mixes of five different glazes — a tenmoku from Leach, a low firing celadon from Len Castle, (Ying Ching), a limestone from Helen Mason, a magnesia from Daniel Rhodes and a gorse ash glaze from a local earth. Used in combination with oxides — iron, cobalt and manganese principally — and varied with salt glaze, the results are diverse enough to preoccupy me for years.

The session regime allows me to concentrate all my energy on a narrow area — throwing big pots, throwing domestic ware, then glazing and firing. The time between these means that each is approached anew so that I have to learn again. I may not have made a batch of 200 mugs for up to six months or fired a kiln for the same length of time. Each part of the session will start tentatively, sometimes with failure, rising to a pitch of concentration and success towards the

end. I try to avoid "knowing". I never take notes in order to repeat the pots I like. This is a deliberate approach to try to encourage a deeper instinctive understanding of the process and the materials. Often I simply forget — to put enough grog into a batch of big pot clay for example — and the results can be catastrophic. I prefer that though, to the certainty of control and domination of materials possible through recorded experience.

So too I prefer the shapes of my pots to be unintentional. The shape of a food bowl will depend on arbitrary factors like the consistency of the clay. I watch the movements I make when throwing and attempt to simplify them and make them more precise. A pot thrown beautifully, becomes beautiful. In this way the pots are closer to me rather than belonging to the technology.

The craftsman's way

My major preoccupation as a potter is to clarify exactly what I am doing in producing work for people. There is a confused attitude amongst potters in New Zealand because of a mingling of two quite different idioms — that of craft and that of design. There should be a firm distinction between the two. They are at opposite poles in their view of their work and the people they are intended for. Design is right in the mainstream of our materialistic Western society. Craft tries to link communally with all peoples in terms of those things that are common to them all — like eating or sleeping.

The cultural origins of the work of some of our potters is not craft, but that part of our Western artistic tradition appropriately labelled design. These *designers* are seen by some, as leaders of the *craft* movement. While they are certainly highly publicly acclaimed they are really more appropriately seen as leaders of fashion. To label them as craftsmen is a great disservice to both groups — their intention is not to be craftsmen. They would probably rather be seen as artists or sculptors. Design is involved with change, development, sophistication and fashion. It is highly individual, intellectual, contrived and articulate. It is similar to pop music in that it is entertaining and must attract attention. A designer flaunts his technology (since that is our Western obsession), so his work may be articulate and perfect.

Westerners see the artist as leading from the front, society "benefits" by vicariously sharing the artist's experience. Since he must see himself as unique and individual his work becomes self absorbed and egotistical. The "user" receives the work intellectually, passively as an observer. This denigrates the user and places the designer in the position of a superior, able to lead others — an elitist stance which is also typically Western.

The "avant garde" design work being lauded around the country now is not entirely appropriate to New Zealand. We are never going to be in the vanguard of strictly Western culture, partly

I consider this pot made six years ago my best. It embodies all I feel about pots - salt glazed with cobalt and manganese colours mixing. A wine cup.

because we are not entirely a Western nation. If we have any identifiable orientation it is as part of Polynesia. The Maori stress on community — submersion of the individual — and identification with the land has been absorbed into our culture. These philosophies form a fertile cultural environment for the craftsman.

We also have a lot of myths about our capacities as equal participants. We lay some stress on the private sector of our lives and on the similarities of other lives. It is for these reasons we embrace pottery so enthusiastically. Not only are we able to make it easily because of our native adaptability, we also value its celebration of the mundane in our lives. We want to use what we or our fellows have made. A side by side stance of maker/user is what craft work is all about.

A craftsman is a midwife to his pots and not their master. Reflecting the Maori relationship with land, the potter's relationship with his materials, kilns and processes cannot be domineering or egocentred. The potter's self expression is accidental rather than intended: he is perceptible through his work only in that he is another human being. He can disclaim responsibility or credit since his work is apart from him. The work's independence comes through its usefulness, which gives it a reason for being there other than the potter trying to express himself. This is no easy task, since clay is such an easy medium to use that it is difficult to avoid having the pot become an expression of the ego. Even the strong definition of a shape can become too assertive and domineering.

To discover those parts of his work which merely manifest his education and cultural conditioning is very difficult. Most of the Western values with which we are assailed constantly impede the development of a truly peaceful, harmonious simplicity. The craftsman is in opposition to the mechanisation and materialism that surrounds us, work reflects all those

Casseroles – the simplest shape determined by function. All oil fired stoneware. Decorated by mixing bands of glaze and oxide.

Left: Vases made in peasant tradition. Within a peasant stance it is still possible to retain a primitive simplicity when making pots for the eye. Right: Planter, bottle and small crock, salt glazed, woodfired.

features of our society the craftsman is trying to balance and compensate for.

Craft work is most often intended to fulfil very simple needs — a cup to drink out of, a chair to sit on, a jersey to wear. These sorts of needs — to keep warm or to sit down or to drink — are common to us all. The craftsman is intent on that common ground. The justification for his work is that it will be used and the use establishes a link with the community, which makes his orientation communal rather than egocentered.

It is important for a potter to understand the differences between design and craft and to be able to evaluate pots in those terms in order to resist the pressures which will constantly try to pull him into the mainstream.

The distinct and particular nature of craft and the cultural contribution it makes is not all that well understood. Too often critics will say that designers are "expanding the narrow horizons of craft workers". Or retailers will encourage decoration in order to sell work more easily. The exhibition obsession encourages exhibitionism. But there is little encouragement directed specifically and effectively towards the simple useful crafts. Since exhibitions that give prizes encourage competition, participants may try to make their work noticeable or outrageous. This tendency spills over into one man or group shows since it is seen to be "more interesting". Even the selling system through craft shops encourages a consumerism which is not conducive to good pots.

Within this dual framework it is sometimes difficult for the craftsman to retain his integrity. He must examine his own standpoint carefully so that he can be guided by his principles and be faithful to a coherent philosphy.

The development of crafts is really dependent on ordinary people — the family that mows its own lawn, or plays sport on Saturday. It is for these people that domestic ware is made. Using handcrafts should be an enriching experience, — the craftsman seeks to share with the user. He does his work on behalf of us all.

We are lucky in New Zealand that this is still possible.

Left: Large bowls diam 325 mm

Jim Greig

Photo: Alan Cook.

First taught to pot by Len Castle in the early 1960's. Married to artist Rhonda Greig. Wide interest in all the arts. Involved in the Rudolph Steiner Movement. Founded Craft Link International to help hill tribes in Northern Thailand — by adapting crafts to Western market requirements — to maintain their craft standards and retain a cash income during slow transition from opium cultivation. Flies a hot air balloon.

Own work — all sculptural, but still pottery. I try to experience the formative forces behind the forms in nature.

Thoughts on the techniques for making pots.

Just as clay has its own characteristics as a material, so different techniques have their own essence or tempo.

Our attitude of mind when we approach one technique should not be applied automatically to other techniques. The real artist discovers that each technique has its own freedom which he must respect if he wishes his work to have life. The laws of the medium reveal themselves to the sensitive potter as he works. Tuned to them, he uses them. Many happy accidental effects are examples of the artist's allowing the medium to control the work.

When a potter makes a pot that is not a true expression of the medium, the result has a tormented look. He looks for ways of overcoming obstacles of technique to communicate his ideas. The limitations stimulate him to fresh creative activity. In mastering the technique he reveals its own potentialities, and also his creative spirit.

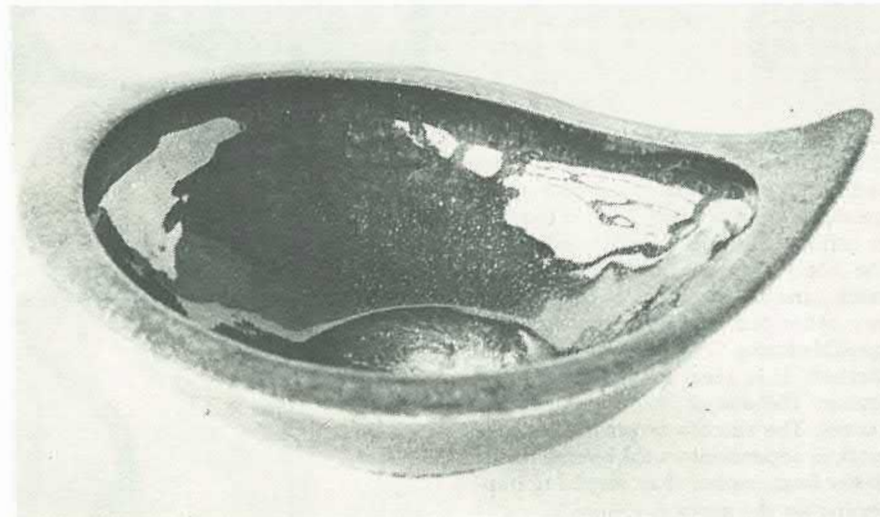
When the resources of the technique are guided by fresh imagination and keen perception, we get the wonderful rare living pot. Its beauty speaks for itself.

Throwing is an amazingly direct expression of the personality, like handwriting. The same form can be made with infinite nuances of feeling. Throwing is especially responsive to a spirited temperament, and better suited than other techniques for bringing forth the form of the pot.

Improvised combinations. Some of my earlier growth form bowls series were made by using a thrown form as a base, then altering the shape at the top, and adding clay to form a new sculptured form. (photo 1)

The success of this approach depends, I believe, on making a total transformation and not ending up with the disturbing result of a thrown pot having an added part spoiling the symmetry. This is a technique where the potter imposes his will on the medium. It needs sensitive handling.

The throwing technique suits pots with a thin wall of clay, and when I wanted to develop pots where the form



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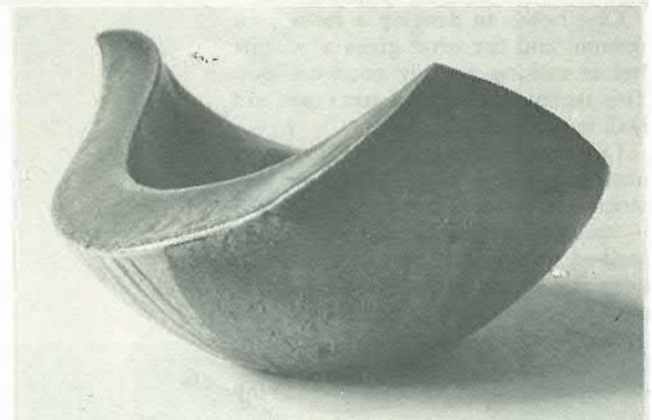

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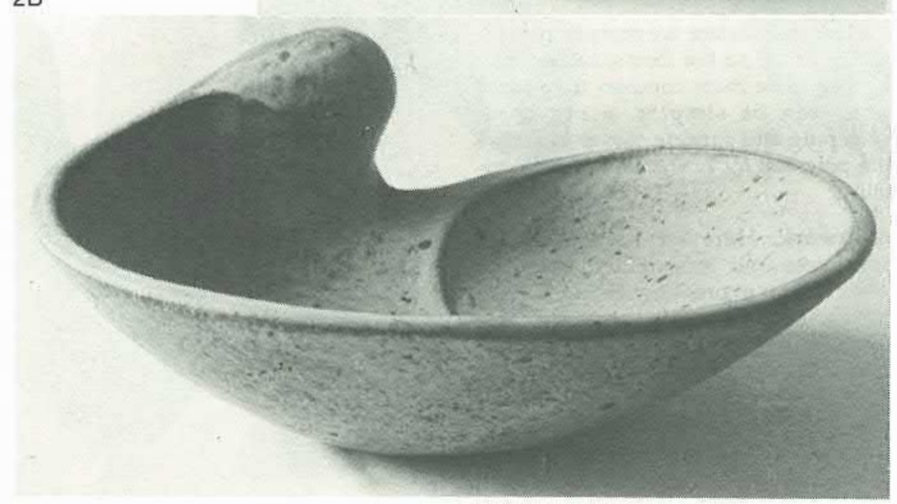


2B

arose out of a more solid mass of clay, a new technique was called for. These pots were made by beating out a thick lens shaped mass of clay with the hands. This was then draped over a curved form, then turned over and placed in a shallow biscuited saucer-shaped bowl somewhat smaller than the pot being made. Wads of clay for the top of the pot were then added and shaped by hand with great care to achieve smooth flowing lines. To smooth the inner surface I use the edge of a small flexible plastic funnel, a useful tool which can be squeezed in the hand. (photos 2A and 2B). With a good hearty clay mixture (Huntly fire clay 7; ball clay 5; grog 3), these pots could be made up to three inches thick without danger of cracking.

Coiling large scale pieces. Coiling is a deliberate process and demands more technique than throwing. It also needs greater effort to infuse life into the pot. In coiling, the considered intentions of the hand are carried out more accurately, and it offers more freedom than any other technique for the scope of possible forms. Though it is a piecemeal method, it is ideal for free forms and favours the use of billowing, flowing curves. The success or presence of the work is dependent on the overall thrust of the form, rather than anything happening on the surface. (photo 3).

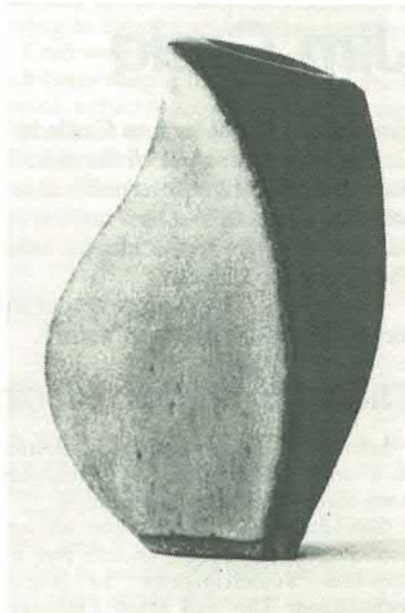
One needs to develop a feeling for volume and for what gives a pot life before making a really good coil pot. This technique requires great care and skill to achieve.

I am now building up some large pots about four feet high, using as coils strips of clay about four inches by a half — using a clay mix similar to that described above. As it is important to keep the thrust of the surface flowing surely and smoothly right from the base, I work in a room not brightly lit, but with one side lit from a small window which shows up the surface of the pot well.

Mass and surface are more important at this scale, so the forms, rather than having to be more complex than small pots, can be simpler, using bold, sweeping and surging curves to realise the potential for power and monumentality.

Slabwork. Here we have a certain harshness and inflexibility, but with potential for expressing feeling. One of the attributes of satisfactory slabwork is the swelling taughtness of a cleanly bent slab. At its most dynamic it can convey the power of a drawn bow. Those stiffish curves are also good for giving a feeling of hollow volume which is difficult to achieve with fine slabs. These often shrink making unsightly

3



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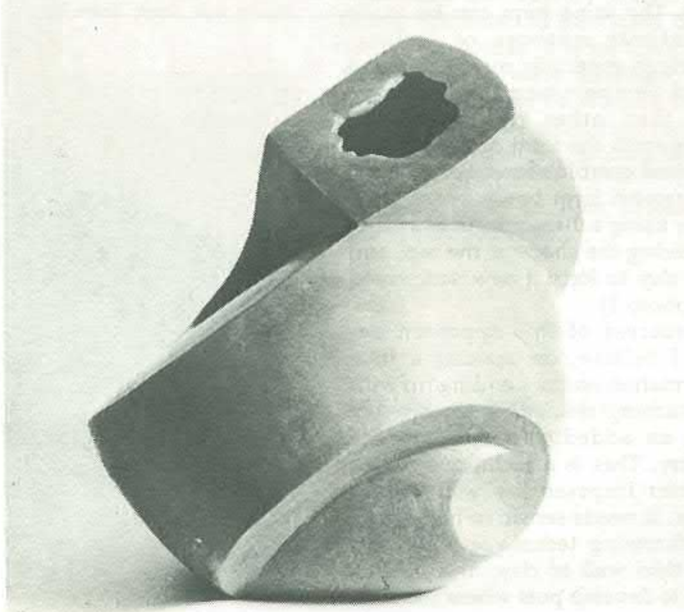


wrinkles. Putting even a slight curve into the slab avoids this (photo 4).

Slabwork is best kept alive by working dangerously — close to the limit. Bend the slabs when the clay is almost able to support itself, and is not yet stiff. I often support the first slabs of a form temporarily with bent cardboad strips propped with clay as well.

A danger occurs when pressing mitred corners together. The corner often bulges outwards. I usually squash a roll of clay on the inside, then pare the outside down smooth with a knife.

Slabwork should retain its taughtness, but it also needs the charm of a degree of softening to allow for some subtlety.

The technique is specially suitable for large works suggesting composure and formality, but it need not be rigid. When I began a recent series of pieces using intersecting planes with suggested volume in the voids between them, I first built up the basic slab form, then cut through at various angles to change the form. Thus the technique gave freshness to the idea of the pot.

Press moulding. This is an extended form of slabwork — a useful technique for making more intricate pots. It is useful too if you want to turn out numbers of pots, but a developing artist will use it as a necessity rather than as a convenience, and will be aware of its positive and negative aspects.

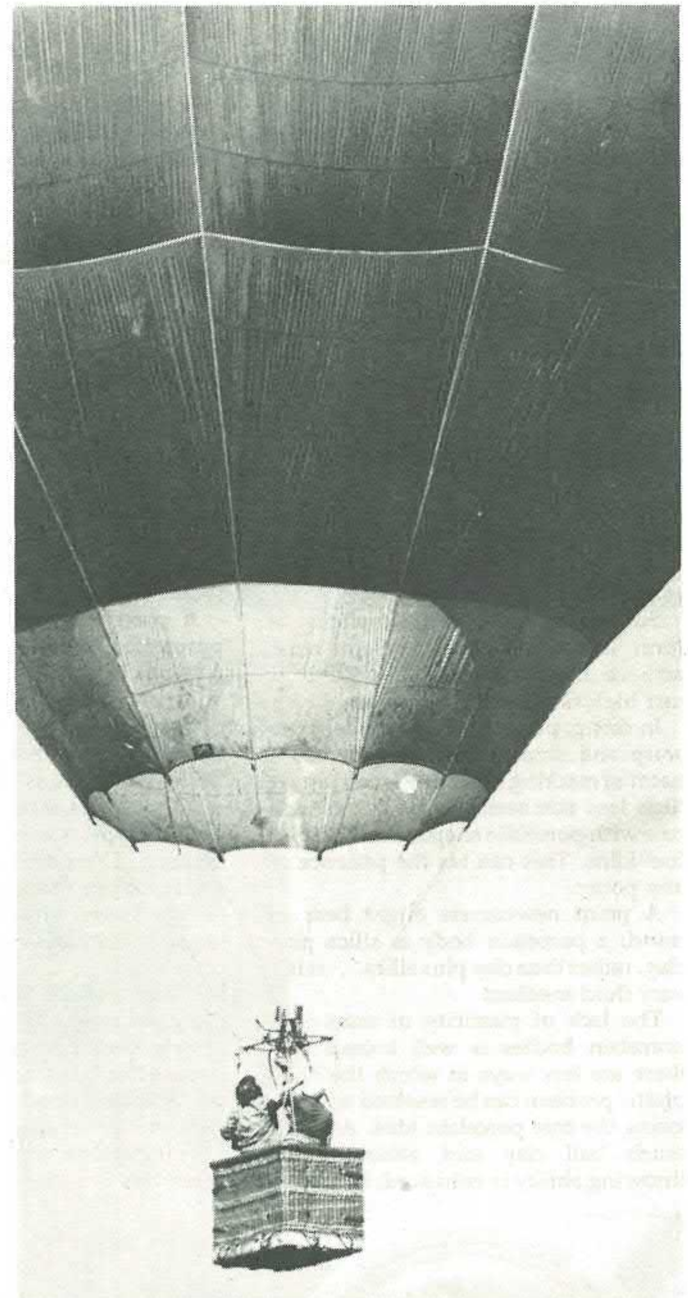
There is no spontaneity in mould work, but the rigidity can be compensated for by having a flexible attitude. Potters who do repetitive work usually perfect their shapes as they develop a better understanding of them. Likewise its good to be prepared or even eager to discard the mould for an improved one to keep the forms progressing. (Photo 5)

No character can be added to the work in the moulding process, so it is essential for good results that the original model has real verve and presence. An interesting bonus is that you have the opportunity to study the negative impression of your pot. This can be fruitful in developing a sense of form.

A wider variety of forms can be moulded using the technique of pressing the clay down firmly onto complicated curved surfaces by splitting it where necessary then patching up with wads of clay.

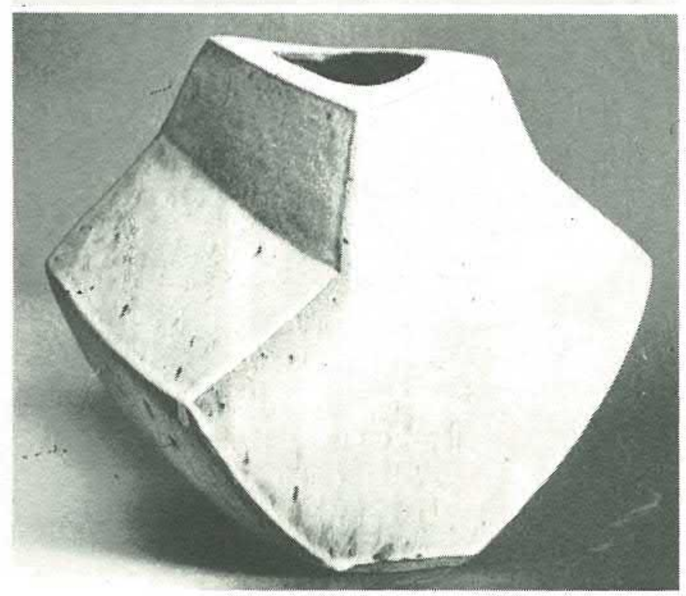
In the search for new effects and new techniques which seems to be widespread these days, it may be timely to ponder this thought, that new forms can grow out of the limitations of the clay, and that development is not so much getting around these limitations, but in seeing them more clearly. The clay is not brought to life by techniques or by effects. That life is the manifestation of the spirit of the artist.

Photo: Phil Green



Pots by Jim Greig within 12" high or broad.

Photos: Jenny Hames



Jim Greig
Matarawa
Carterton

Iain Crichton

Started potting in the Wairarapa ten years ago with Jim Greig. Lived among potters and pots throughout childhood in Titirangi. Pursued arts course at Auckland University which included history and theory of arts. Runs cattle and sheep on 45 acres. Grows nut trees and fruit. Keeps house cows, pigs, bees. Carves and incises porcelain. Also makes a full range of domestic stoneware with brushed decoration.

Notes on the use of porcelain for thrown ware and the firing of porcelain in solid fuel kilns

The decorative scope of porcelain has long held fascination for me. By using the translucency of the clay with carved and incised decoration, the three dimensional effect with shadows, heights and depths can be emphasised. The delicacy of the form and the clarity of the glaze makes it a more demanding and precise medium than its more robust cousin stoneware.

Subtley of glaze and simplicity of form are the keys. Porcelain must achieve translucency, otherwise it is just high fired white stoneware.

In firing, porcelain has a tendency to warp and slump. In cooling it has a habit of cracking if cooling is too fast. A high loss rate seems to be the general rule with porcelain shapes fired in solid fuel kilns. This can tax the patience of any potter.

A point newcomers might bear in mind; a porcelain body is silica plus clay, rather than clay plus silica . . . it is a very fluid medium.

The lack of plasticity of most true porcelain bodies is well known and there are few ways in which the non-plastic problem can be resolved without losing the true porcelain idea. Add too much ball clay and although the throwing ability is enhanced, the properties of true porcelain are lost — you are left with a sort of white stoneware. Add more silica (free), anything over 23% and the body becomes stronger, more toothy, however the translucency decreases and the body may cause the glaze to shiver and spall. If you make your pots thicker then you lose out completely. They will be heavy and not worthwhile at all.

A porcelain body should be in the proportion of 50% china clay, 30% feldspar, 20% silica. Bentonite may be added for additional plasticity, calcite or dolomite to lower the maturing range (and loss of whiteness!)

The proportions depend very much on the analysis of the china clay and the feldspar type. A white china clay should be used. There are many excellent formulae for porcelain bodies. If you want to experiment with local materials that is good, but it is expensive in time and patience.

When making your own clay body there are only a few points to note. If mixing bentonite as a plasticiser, then be sure this is mixed dry with the rest of the powdered body — it will not mix well with a wet clay. Maturity of clay is very important. Although some potters think this is a bit of a myth, I don't. If the clay is to be used for thrown ware, it must have all the right things going for it, remembering that it has little plasticity, hardly any tooth, is inclined to turn to liquid if too wet whilst throwing and will pull apart at the lightest excess of pressure.

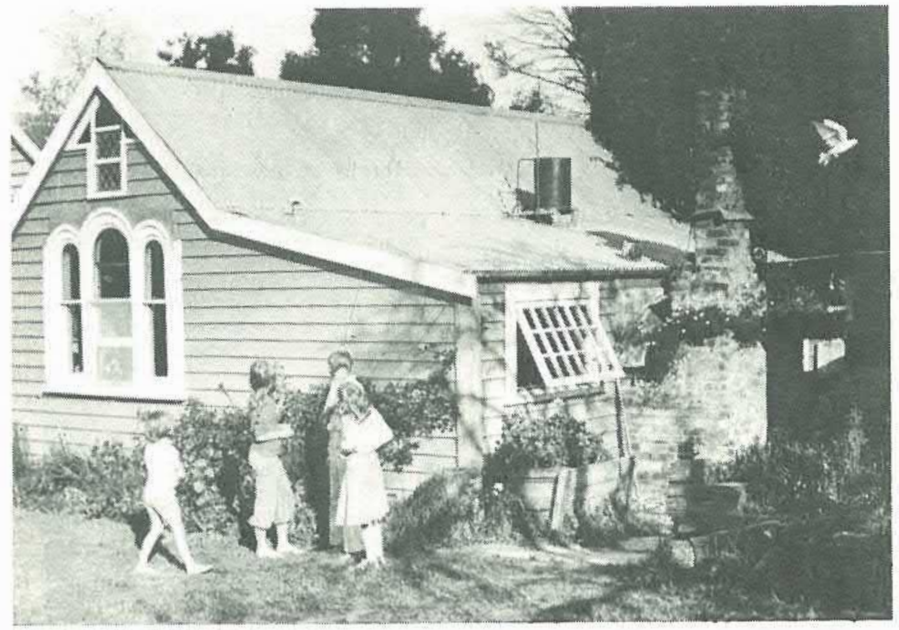
A homemade porcelain body should be first mixed dry, then wetted and trampled by foot in the old method until throughly mixed, then taken and put into wet sacks or plastic and left for as long as possible — as much as two months or more. By this time the smell of decay should be evident. The clay, hopefully still soft and wet should be dried in old plaster moulds until semi-hard, then wedged to obtain an even mixture and packed away ready for use.

Another method that is good but more time consuming is to dry the mixture after it has been initially mixed and wetted and trampled, until the lumps are able to be crumbled into powder and then wet again so that the clay is in a soft state. Usually this clay can be used after the first month of storage. I have found when throwing it is necessary to be as quick as possible. This puts less torque or stem on the clay. Use only enough moisture to allow the fingers to move without grabbing.

However quick and sure you are there is nearly always turning off to be done. Thick supporting bases are needed for tall pots and wide bases for plates and rounded forms. Bottles and jars need thick shoulders and bases. In fact the outside shape of the pot bears little resemblance to the finished product. The potter must work from the inside shape. He must remember this idea of form so that later when he comes to turn it, the form is still there. Irregularities in the thickness of the walls can lead to problems in the firing at a later stage.

Firing is fairly straight forward. The firing temperatures are usually over 1300°C. At this temperature the feldspars combine with the clays to produce a glass silica (silica glass). It is the silica in the china clay combined with the feldspars that produce this silica glass rather than the free silica added to the clay batch. However during a long firing in the higher temperature range this free silica may begin to melt with some adverse results on the stability of the body. Providing that the clay has a balance of the necessary materials — the right silica alumina, feldspar and clay content, a long firing is beneficial and the right glass content will be achieved resulting in optimum translucency and minimum of slumping or warp.

Photo: H. and K. Busch



There are some observations to be made from trial and error. Excessive crazing: add more silica — not too much or you will lose translucency — or increase your firing time above 1250°C. This will allow a greater percentage of silica glass to be formed from the interaction of the feldspar and the clay. If the ware starts to shiver, reduce the amount of silica. Possibly add to the amount of china clay.

Do not be too worried about the feldspar content in your clay. In porcelain it is the silica, both the free and in the clay, that is of prime importance. It is possible to reduce the maturing temperature of the porcelain by adding more china clay, less silica, and possibly more feldspar. Traces of calcite and or dolomite can help. Experiment with various china clays may produce a lower firing porcelain without having to lose any of the properties of true porcelain. However there is a risk that the strength or hardness may be impaired. Porcelain is a high fired, hard, translucent body, and if the body you evolve is otherwise, it may not be true porcelain.

When firing porcelain ware in a solid fuel kiln, certain points can be noted:

Ware should not be subjected to direct flame because of the risk of slumping or warping — a fairly long soak period between 1100°-1300°C is desirable for silica "melt" in the clay.

Insufficient soaking will produce poor translucency and vitrification in the body. Your kiln has its own secrets and only you can find out how long you must soak your ware. Experiment!

The kiln should be allowed to cool untouched from about 300°C-100°C. This is the annealing phase and as with glassware, it is most important. However, a rapid reduction in temperature after the kiln has been turned off is often thought as beneficial as the fluid state of the ware when it is at maximum temperature leaves it in a very delicate state, almost soft. Reducing the temperature gently, allows the ware to regain its rigid strength. This is a matter of opinion.

The structural form of porcelain at high temperatures — that is when it assumes a glass-like quality, is most subject to the pressures that are found in a kiln that burns solid fuels. Strong flames and draughts can cause damage if the ware is in direct contact. To reduce loss due to excessive movement in the kiln atmosphere some simple steps can be taken.

The shelves should have a good covering of silica/alumina wash to prevent the bases from sticking to the shelves. This will allow a degree of movement in the pot, and prevent chipping from the base when you remove the fired article.

I have found a mixture of stoneware and porcelain ware has advantages. The stoneware acts as a baffle against the harsh flames that would otherwise push against the soft porcelain. I increase the refractoriness of the stoneware body so that these "baffles" remain very saleable. The system usually works.

The alternative is to make saggars or buy them at high expense. Using saggars is limiting as regards shape and also they limit the effect of reduction atmospheres which are important to many glazes.

Whatever success the potter who uses porcelain may have, the product will be more expensive in time and materials than a similar product in stoneware. Losses are higher, materials more expensive, fuel bills greater, patience at a premium, in fact sometimes one wonders what the point is. I think the results are worth it and patience does have its rewards.

Iain Crichton
Honeywood
Cobden Road
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Exporting

Recent developments in taxation on craft industries have brought a significant number of inquiries to the Department of Trade and Industry from craftspeople wanting to know how to export their products to overseas markets.

The would-be exporter of pottery or any other craftsware faces two main problems: product standardisation, and pricing.

To achieve any kind of market penetration, however limited, it is necessary to be able to offer prospective importers assured quantities of items of the same type. Hence, a degree of commercial commitment is a sine qua non of any serious export effort.

The discipline required to investigate market requirements and undertake regular, standardised production, does not always sit easily on the shoulders of New Zealand's potters. A few appear to feel this type of commitment is incompatible with maintaining their artistic integrity.

New Zealand has a very good record in the quality of its crafts, and markets are accessible to those willing to follow through the necessary administrative procedures.

It is possible to sell small quantities of unique items to shops and galleries that cater for the top end of the pottery market. However, this type of selling is often difficult and expensive as it usually involves a personal sales trip by the potter or his agent. The very exclusiveness of this kind of trade can limit the possibilities for future orders.

The question of price is crucial. To craftspeople just starting to sell to the public, a typical markup of 40-60 percent imposed by the retailer can come as a small shock.

Export ambitions can wither overnight on the discovery that to remain competitive, the producer's return on a typical consumer article sold, for instance, on the West Coast of the United States, can often be no more than a third of the eventual retail price.

Freight, insurance, documentation fees, tariff restrictions, import duties, sales taxes, and distributor and wholesalers markups all take their toll.

Craftsware cannot normally stand this type of markup. The craftspersons or their agents must therefore usually arrange to sell directly to the retail outlet in person. In any case the small quantities involved generally make this inevitable.

Sales Channels

Broadly speaking, craftspeople interested in export have three options open to them. Firstly, they can sell to a craftsware export agent who runs the risks but also reaps the rewards. This is probably the easiest means of exporting, and a list of agents is available from the Department of Trade and Industry.

Secondly, a craftsperson may join or form a cooperative with others nearby and export through the cooperative. A sufficiently large cooperative can assure both continuity of supply and organisational economies that benefit all its members.

Thirdly, an individual may export on his or her own account. This can involve a lot of personal research into possible markets. It would also require finding answers to the following questions:

- **How serious am I about exporting?**
  Do I intend to make an earnest and reasonably long term effort to discover and supply a market for my goods, or is my interest only the result of a short term production surplus?
- **What are the minimum quantities of pottery I will have available for export on a continuing basis?**
- **Where are the possible markets for my pottery?**
  Other potters and the Department of Trade and Industry may be able to suggest possible markets, but personal visits to your "target market" may have to be considered.
- **What are the prospects of my product? Can I offer something that is either unique in some way, or superior to other similar items already on the market?**
- **How would my work have to be packed, and how much would this cost?**
  Again, other potters may have suggestions, or you could approach any freight forwarding company.
- **What about export documentation, and insurance?**
  Your local Chamber of Commerce will advise you. Otherwise, any freight forwarder or customs agent will deal with this for you.
- **What labelling requirements must be met by both my work and its containers? Are certificates of chemical analysis necessary? How much would testing and certification of my work cost?**
  The Department of Trade and Industry will advise you of any requirements.
- **What will be the total cost of freight, both inside and outside New Zealand?**
  Your local transport company, the shipping lines and Air New Zealand will readily give you a quote. You must know the weight and preferably the size of your crated consignment.
- **What duties or sales taxes would my work incur? Who is responsible for paying them?**
  Again, the Department of Trade and Industry can advise you of any applicable duties or taxes. Responsibility for paying them will depend on the type of quotation (e.g. "cost insurance freight" (C.I.F.) or "Free into store" (F.I.S.) that an importer is given.
- **How will I arrange payment? How can I be sure that I will be paid?**
  Your bank will give you full details.
- **To what extent would the various export tax incentive schemes currently in force improve my financial return?**
  Details of the incentive schemes are available on request from the Department of Trade and Industry.
- **Assuming that I now know exactly what it will cost me to make and despatch a consignment of goods to an overseas customer, will my price be competitive? Will the financial return to me justify the work involved?**

Only by answering these questions can a realistic assessment of the viability of a crafts export venture be made.

Failure to answer these questions can have disastrous results for the ill-equipped potter making his first foray into the overseas market. Recent cases have included a potter who took several cases of pottery to Australia as personal luggage and attempted to sell them round craft shops and galleries. He met with little success, despite the fact that he was selling at a markup of only 20 percent over his domestic price. He did, however, accept some orders. Having made no allowance whatever for the cost of freight or insurance, ignorant of duty, sales taxes and the testing and labelling requirements, he thus guaranteed himself a considerable loss should he even succeed in landing his goods in Australia.

Luckily, few people attempt so much on so small a fund of knowledge. But the need for as much market information as is available and a complete grasp of the business procedure involved cannot be overemphasised.

Crafts Catalogue

The increased level of interest shown by potters in exporting, justified research into the viability of crafts export to various potential markets.

In association with the New Zealand Crafts Council, the Department of Trade and Industry conducted a survey of craftspeople to produce a catalogue of craftsware that would be available to overseas buyers.

Information from about 75 responses to a questionnaire sent to craftspeople who had indicated an interest in exporting crafts was compiled into a catalogue now held at all of New Zealand's overseas trade posts. In addition, companion volumes of photographs have been sent to eight posts in selected countries.

The department hopes the catalogue will go some way towards improving overseas awareness of New Zealand as a source of high quality crafts.

N. Holm
Department of Trade and Industry
Wellington.

Photographs by Ray Erikson.

Voices in clay

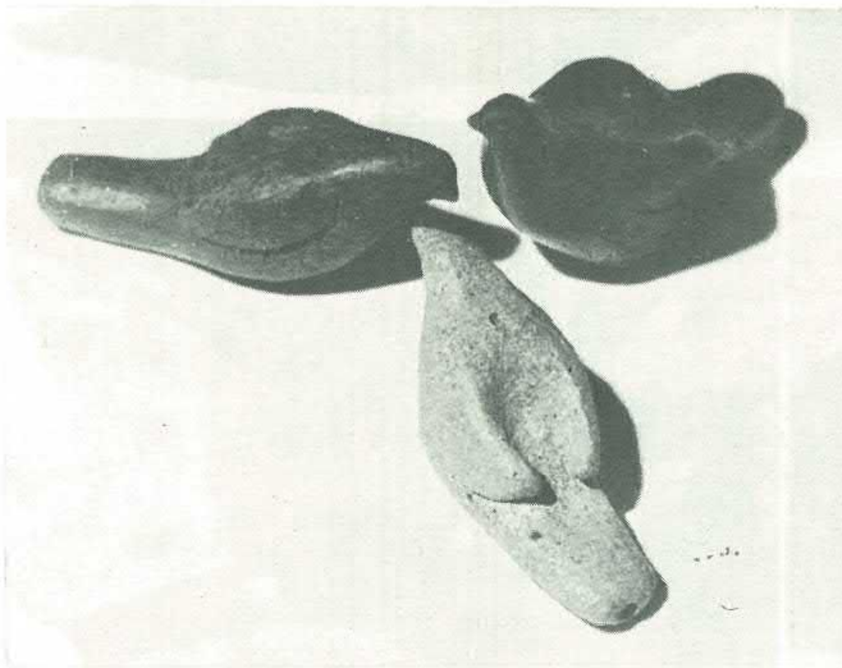
VALERIE MOSS

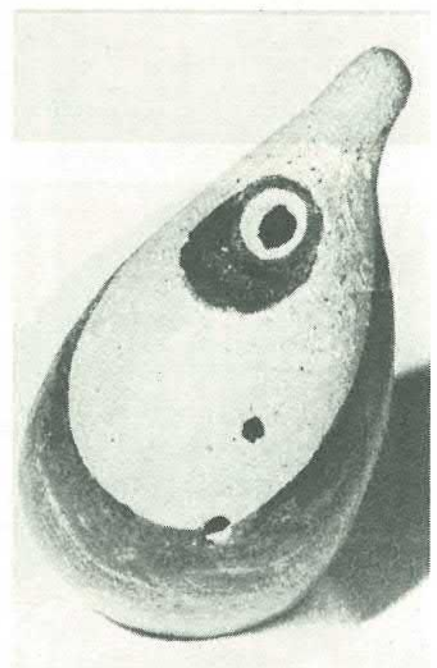
Ocarinas must be among the oldest musical instruments in the world. They are modelled out of clay, a material available in nearly all parts of the world, and consequently many different cultures produced their own variations of them.

The principles of construction remain the same — a column of air is directed via an air duct onto a sharp angled edge (a 'fipple') which causes the air to vibrate, and to produce a sound. The pitch is determined by the size of the hollow chamber. The smaller the chamber, the higher the note. Add holes, and you add notes. Do this carefully enough, and you can produce a tuned instrument. The logical and grand extension of this is the Ocarina Orchestra; such groups were to be found in the United States earlier this century. If you have a recording of ocarinas being played, or, indeed, an old ocarina, I would be enthralled to hear it. Ocarinas have generally been regarded as humble instruments, for children and peasants (the exception is ancient South and Central America, where they were highly regarded, and connected with religious and royal festivities), and consequently little is to be found regarding them, either in libraries or museums in this country.

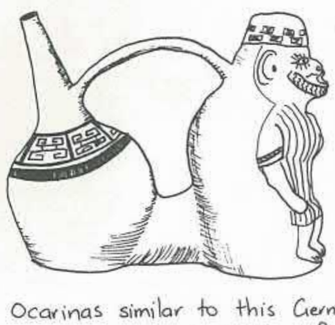
Any hollow form may be made into a whistle or ocarina. This principle, plus the versatility of clay, means that endless variations in shape are possible. Some follow the simplest form needed, and concentrate on the musical qualities, whereas others are more modelled, with only one or two notes, and cannot really produce a melody. The former I generally call 'ocarinas' and the latter 'whistles', although the two terms are generally used interchangeably.

The ancient Mayans, Incas, and Aztecs developed whistles to a high degree. The whistle in a ceramic figurine became the voice of the god the figurine represented, giving it a mystical quality, and a life of its own. I seek for the same kind of qualities in my own ocarinas. They are not just pretty novelties or toys, but serious pieces of modelling — clay sculptures with the added surprise of sound.





American Whistle. Earthenware bird on a base. 1800 - 1850. 9.5 cm high. Deeply incised.

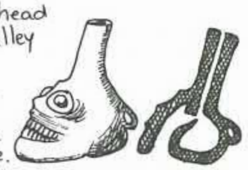


Whistling Jar from Peru. As the water is poured from the spout, air is drawn in through holes in the head, over whistling devices, making the God-figure come alive.

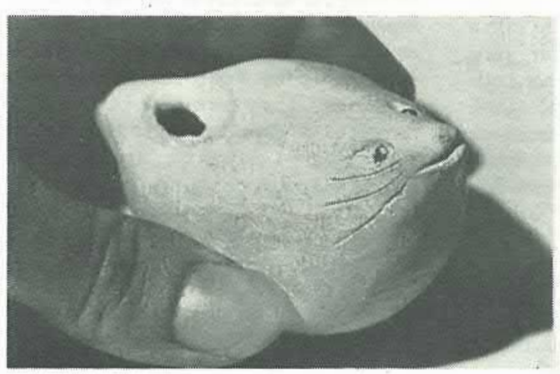
A Medieval English whistle, almost a metre high. When placed inside a chimney, the up-draught going through the holes produced a resonant sound. They were used in Central Europe, Sweden, and North America as well, and were believed to frighten away evil spirits.

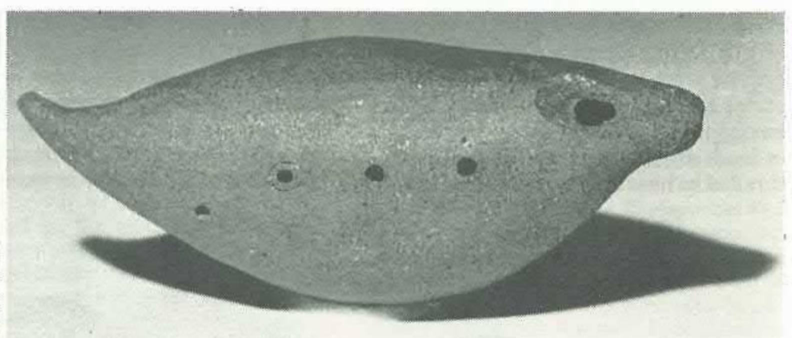
18th Porcelain Ocarina, made in Meissen, Germany.

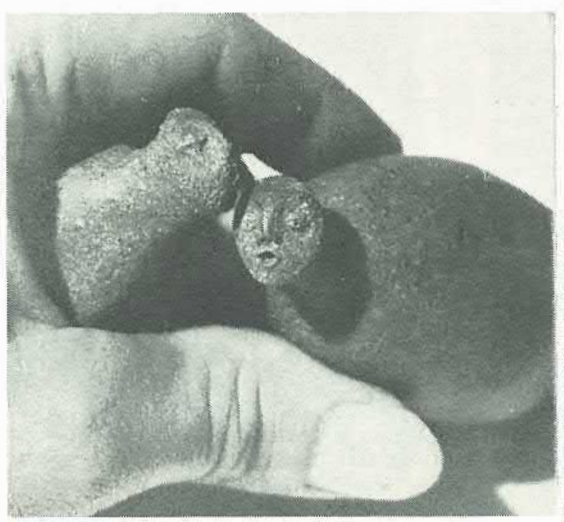
Ocarinas similar to this German one were made in Italy. If you saw Bernardo Bertolucci's film '1900' you may remember the peasants' picnic/dance to the accompaniment of many large, round, red, very tuneful ocarinas.



Skull-like head from the Valley of Mexico. The whistle and the modelling are quite separate.

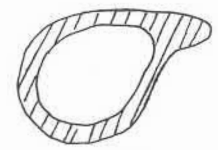




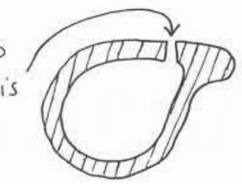


MAKING YOUR OWN WHISTLE.

① Form a hollow shape, with a solid protrusion from wet clay.

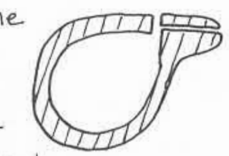


② When it is firm enough to hold its shape, guess this position, and pierce a hole.

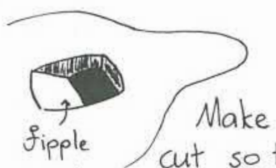


③

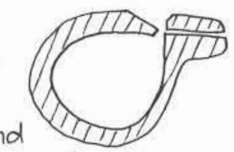
Looking down the hole you have made, guide a needle down the centre of the protrusion, so that it comes out half-way down the wall of clay. Move the needle from side to side to make the hole a slit.

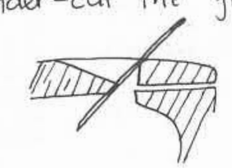


④



Make a sloping cut so that the bottom edge is sharp and straight, and is directly opposite the air slit. You will probably need to under-cut the 'fipple' to do this.





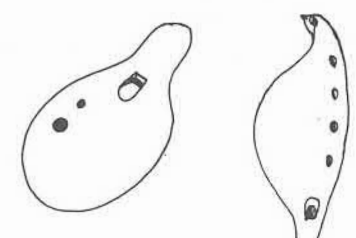
⑤ Test blow.

You should be getting a sound - high and clear if the chamber (hollow space) is small, and deep, but probably "woolly" if the chamber is large.

If no sound, (or a very slight one):

- make sure the air slit is clear of debris.
- try enlarging the air-slit width-ways.
- make sure the fipple and air-slit are aligned. Carefully adjust the fipple with pressure from the needle.
- The space between the fipple and the airslit may be too big. (ie, your first hole was too large.) Probably best to start again, in this case.

⑥ You can introduce more notes by adding finger-holes. I can't tell you much about this, since I'm still working on it myself. Perhaps you've got some words of advice on it for me.



George Wettlaufer

CO_2 Gas Analyzer: Part II

The main purpose of this research was to develop a chart which would enable potters firing reduction to accomplish three ends:

1. To reproduce desired results from one firing to another
2. To convert from one fuel to another, in the event of fuel shortages, and still achieve the same firing results
3. To conserve fuel by firing efficiently, without adversely affecting the end result.

To accomplish these ends, a device called a CO_2 gas analyzer was to be used to sample the CO_2 in the kiln's atmosphere.

The gas analyzer enables the potter to monitor what is happening inside the kiln during a firing. It does not control anything. It is a tool used to measure the atmosphere the way a pyrometer measures atmosphere and temperature—the two most important factors in firing. The gas analyzer, however, does not explain many of the other variables which affect the final results of firing.

To validate the gas analyzer readings against a specific end result, a clay body matrix was developed which, when fired in different kilns with different fuels and varying amounts of reduction, would change color accordingly. An indicator glaze, an iron glaze which ranged from yellow in oxidation to deep-brown in heavy reduction, was applied to half of each of the clay sample pieces. These half-glazed clay samples were used to collect visual information on the effects of reduction during heating, as well as the effects of re-oxidation during cooling, on both the clay body and the glaze.

The one difference between the theoretical and the experimental data concerning reduction was in regard to the natural gas, which reduced the clay-glaze samples more heavily than would have been predicted from the analyzer measurements of CO_2. For some reason (perhaps the higher hydrogen content of natural gas), in reduction it is necessary to add approximately 0.5% to the theoretical numbers in the *North American Combustion Handbook* (thereby decreasing the amount of reduction slightly). *All numbers in Figure 1. (the graph) and Figures 2. and 3. should be accurate within half a percentage point, provided that kiln size, firing profiles, and other variables remain constant. These are the numbers potters should use to determine consistency, efficiency, and conversion of fuels.*

CHART B. OXIDATION

This chart expresses the same data as the graph pictured in Figure 1, side B.

% Excess Air Indicated by CO_2 Readings for 3 Fuels

% Excess Air	Neutral 0	10	20	50	100	
Natural Gas	12.0	10.6	9.6	7.6	5.7	
Propane	13.7	12.2	11.2	8.8	6.5	CO_2
Oil	16.0	14.3	13.0	10.4	7.8	Analyzer Readings

CHART C. REDUCTION

This chart corresponds to side A of Figure 1.

% Air Deficiency Indicated by CO_2 Readings for 3 Fuels

	Neutral	Lt.	Med.	Heavy Reduction	
% Air Deficiency	0	10	20	30	
Natural Gas	12.2	10.4	8.7	7.5	CO_2
Propane	13.7	11.6	9.4	7.9	Analyzer
Oil	16.0	13.2	11.0	9.0	Readings

Use of the CO_2 Charts for Fuel Efficiency and Conversion

The peak number (neutral) may vary slightly with the type of burner or location of the gas source, natural gas being variable from region to region, ranging from 11.8% to 12.3% CO_2. The closer the kiln's atmosphere measures to the peak number, in either oxidation or reduction, the more efficiently the kiln is firing. The rounded peaks in the graph (see Figure 1.) show the results of a poor mixing of fuels.

The goal is to get CO_2 readings in both oxidation and reduction that are as close to neutral as possible and still achieve the desired clay-glaze effects from the firing. Put another way, a potter's goal is to use as little excess air or excess gas as necessary for the desired end results. Taking CO_2 readings by sampling the kiln's atmosphere during a firing enables the potter to accomplish this end.

Refer now to Figure 3. If a potter fires with natural gas, for example, he should locate his present CO_2 readings (obtained with the gas analyzer) across from the heading for natural gas. Let's assume that he has been getting a CO_2 reading of about 10.4% during reduction. He will find this under the column headed 10% Air Deficiency, which also tells him that he is reducing fairly lightly. To get the same amount of reduction and equivalent firing results for propane, should he wish to switch the fuels, he will need to get an analyzer reading of 11.6% (listed in the same column under 10% Air Deficiency). And if at a later date he were to switch to oil, a reading of 13.2% (reading down the same column) would give him approximately the same results.

In the changing of fuels especially, visual sampling — the method presently used by most potters to determine the amount of oxidation and reduction — is usually not accurate enough. The hazy look of natural gas, for example, would over-reduce a propane-burning kiln. Oil can almost never be cleaned up enough to look as clear as propane. Use of these charts and a gas analyzer should produce significantly more accurate results than the eyeball method.

Use of CO_2 Charts and Graphs for Oxidation Firing

This section refers to side B of the graph in Figure 1, or to Chart B — both give the same information. Measuring CO_2 during oxidation is useful for biscuit firing efficiently and for the first half of glaze firing.

In oxidation, the CO_2 reading indicates the amount of excess air present and, therefore, the degree of firing inefficiency. Since the amount of excess air present in the kiln's atmosphere cannot be determined visually, most potters fire with much more air than is necessary, and thereby considerably more fuel than necessary is used to heat the additional air. The graph and chart show the fuel savings possible by using minimal amounts of excess air. Small savings are accomplished at low temperatures, but much greater savings occur at high temperatures. The excess air is necessary at low temperatures, both to remove water from the clay and to accomplish heat transfer by convection; but it need not be present in as great quantities at higher temperatures.

1. *Surely the air we take so much for granted should be watched even more carefully than the fuel itself. And how many of us do?*

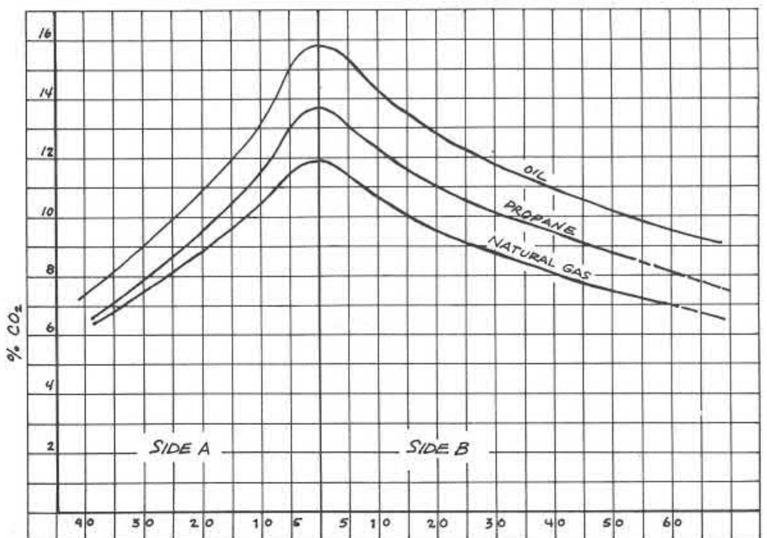


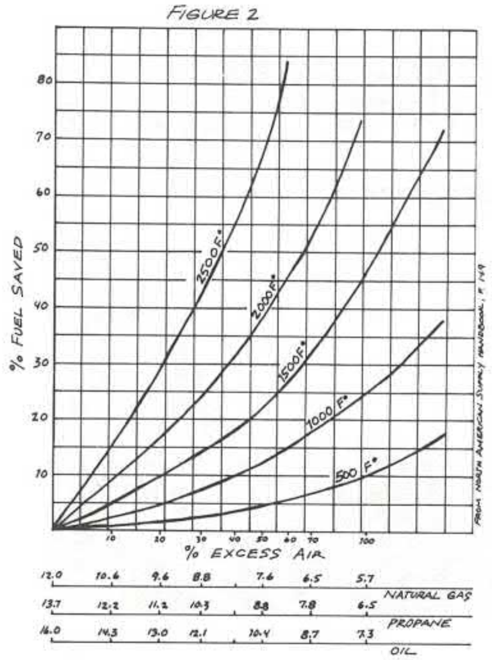
FIGURE 1.

This chart repeats the information expressed in graph form in Figure 2.

APPROXIMATE FUEL SAVINGS POSSIBLE BY CONTROLLING EXCESS AIR

% CO_2 Oil	% CO_2 Propane	% CO_2 Natural Gas	% X-Air	% Savings 500	Temperature 1000	1500	2000 F.
16.0	13.7	12.0	0	0	0	0	0
13.0	11.2	9.6	20	2	5	17	30
10.4	8.8	7.6	50	5	12	22	39
7.8	6.5	5.7	100	10	25	47	82

FIGURE 2



Note greater fuel savings possible at higher temperatures.

Variables Other Than CO_2 Which Affect Color Development

The rate of heating and, especially, of cooling is very important to color formation. An interesting experiment with draw trials bears this out. Two different kilns were fired to temperature with identical profiles. Draw trials taken at the top temperature in each kiln were identical, but the test pieces left to cool in these kilns had final glaze colors that differed from each other, as well as the expected difference from the pair removed before the cooling took place. Kilns of different sizes or kilns constructed with different materials have different cooling rates, which may explain why the CO_2 readings can be identical during the firing, yet the final color results differ somewhat.

Variables Other Than CO_2 Which Affect Fuel Efficiency

The type of burner, type of insulation, size of kiln, rate of firing, and final temperature all affect fuel efficiency. It is obvious that the greatest fuel savings can be realized by lowering the firing temperature. At a given temperature, however, shortening the firing can also produce marked fuel savings.

Developing a Fast Firing Profile During Oxidation

During a firing, the clay body expands and contracts. When, and at what rate, vary in each clay body. The first step in shortening the firing cycle is to obtain an approximate thermal expansion curve for the clay body to be used. Universities with a Ceramic Engineering Department have the facilities to run such a test.

The general principle of fast firing is to go slowly through the temperature ranges where the clay body is moving (to avoid warping and cracking) and then raise the temperature as fast as possible for the rest of the firing.

Our typical stoneware (Fig. 3) shows a volume change at about 525°C during biscuit firing. This is due to the loss of chemical water. Beginning at 900°C, there is a very rapid shrinkage, due to the development of the glassy phase. A fast biscuit firing profile, then, takes about seven hours for a 35-cubic foot kiln, densely stacked. Up to 100°C, you are really using your kiln as a dryer. At this low temperature, with excess air, you're not burning a lot of fuel. From 100°C up to about 500°C, it takes me two hours (a climb of 200°C per hour, with 15% excess air); from 500°C to 600°C, it takes about an hour (or 100°C per hour with 15% excess air); from 600°C to 900°C, it takes an hour and a half (220 degrees per hour with 0%–5% excess air); from 900°C to 1025°C, it takes two hours (50 degrees per hour with 0%–5% excess air). This could probably be compressed even more. Firing this way does demand more attention.

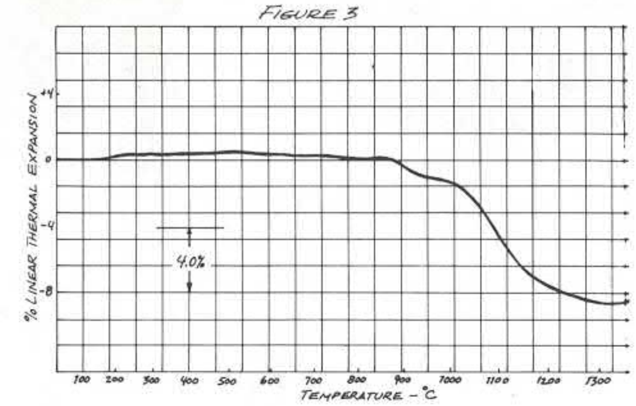
Glaze firing can go up to 1000°C very rapidly. We get to C/6 (where we start body reduction) in 4–4 1/2 hours, seemingly without affecting the refractories or the pots. Fast firing is best left for the oxidation part of the firing cycle, since too many other factors enter into reduction.

A potter's goal, then, in trying to maximize fuel efficiency is to use as little excess air or excess fuel as possible during a firing (analyzer readings should be as close to neutral as possible) to reach temperature in the shortest possible amount of time, yet still achieve the desired physical and aesthetic end results.

1. K.B. Freeman, *Ceramics Industries Journal The Fyrite CO_2 Analyzer, 0%–20% Model*, catalog number 10–5000, is manufactured by Bacharach Instrument Co. Usually available from local oil burner supply houses; or write to Bacharach, 625 Alpha Drive, RIDC Industrial Park, Pittsburgh, Pa. 15238, for closest distributor. Cost at present, about $80.00. Refill fluid, $2.50/bottle, also available through oil burner supply places, good for 100 samplings.

In addition, *a sampling tube* is necessary. We use a quartz (silica) tube, which is available from your local laboratory supply house at a much cheaper cost than the one offered for sale with the analyzer by Bacharach. The standard length should be between 1/8 inch and 3/16th inch. Cost should be less than $10.00. We get ours from the MacAlister Bicknell Co., Box 5, Eastwood Branch, Syracuse, N.Y. 13206. Catalog number 19012.

FIGURE 3

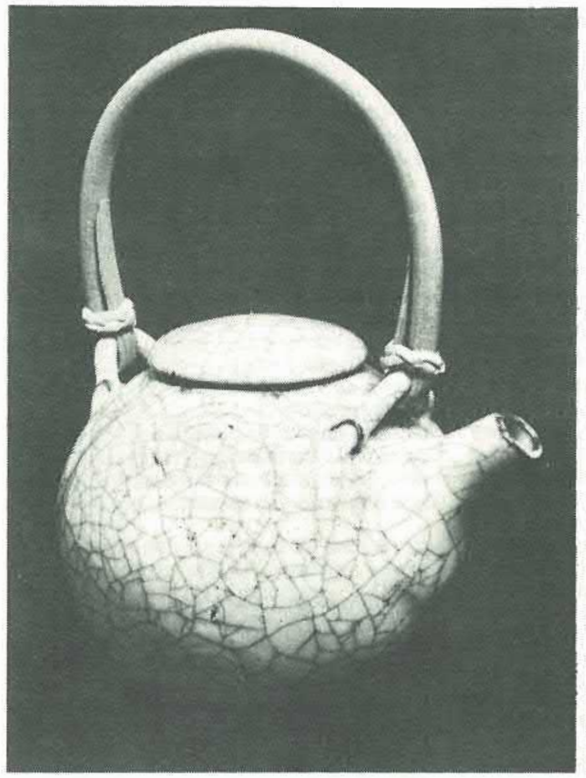


CLAY BODY

FINE LAKE	45
CEDAR HEIGHTS GOLD	30
C & C BALL	12
C-6 FELDSPAR	7
FINE GROG	6

George Wettlaufer is a former engineer turned production potter who lives with his wife Nancy at 12 East Lake Street, Skaneateles, NY 13152. They are the authors of The Craftsman's Survival Manual.

This article appeared in Studio Potter Vol. 7 No. 2. We are grateful for permission to reprint. The first part is in N.Z. Potter Vol. 22/1.

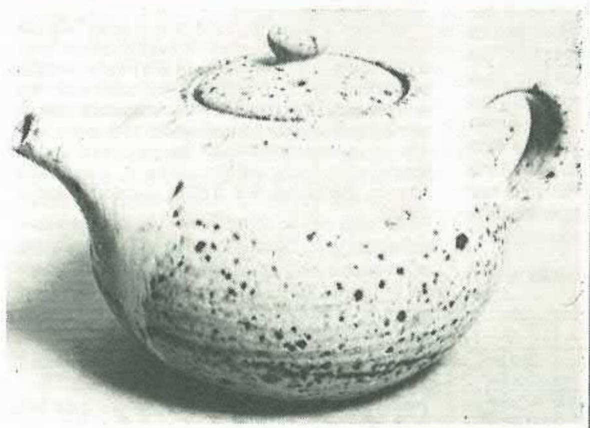


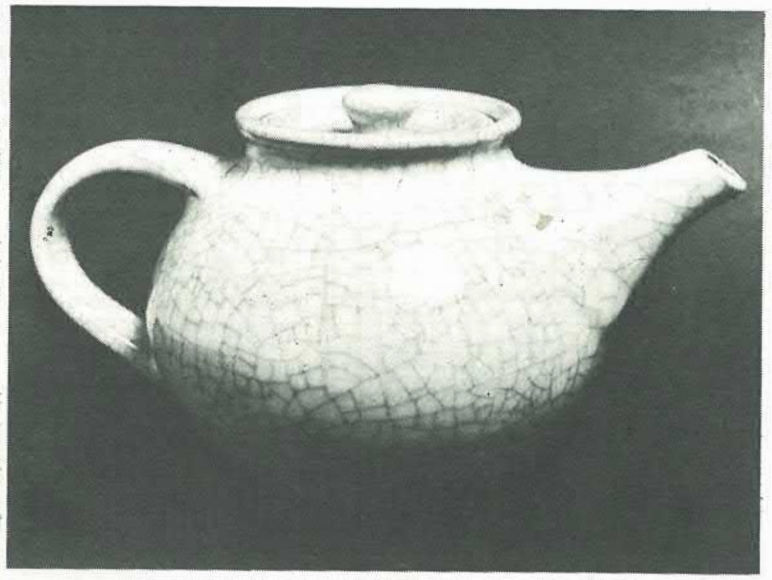
Tea pots at Alicat

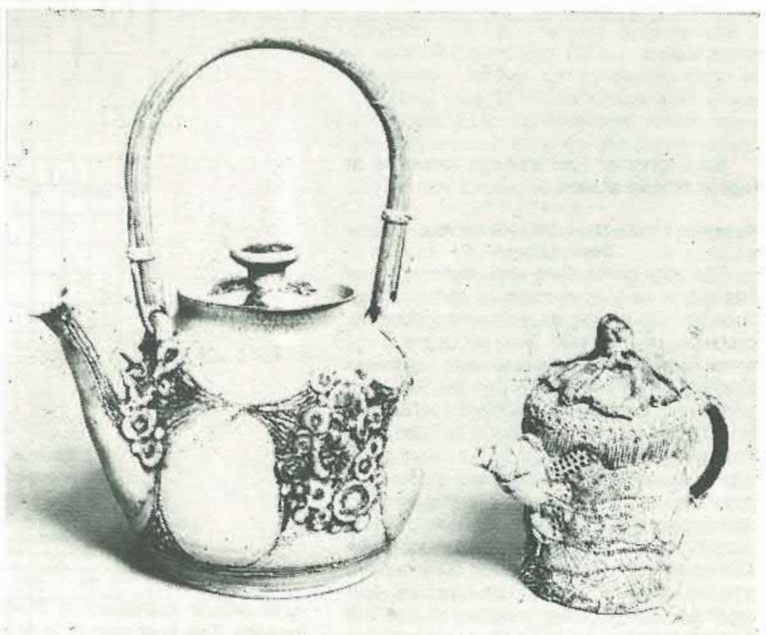
All teapots great and small.
"a teapot has little to do with the efficient pouring of tea, it is first and foremost a poem written in form".
Michael Cardew

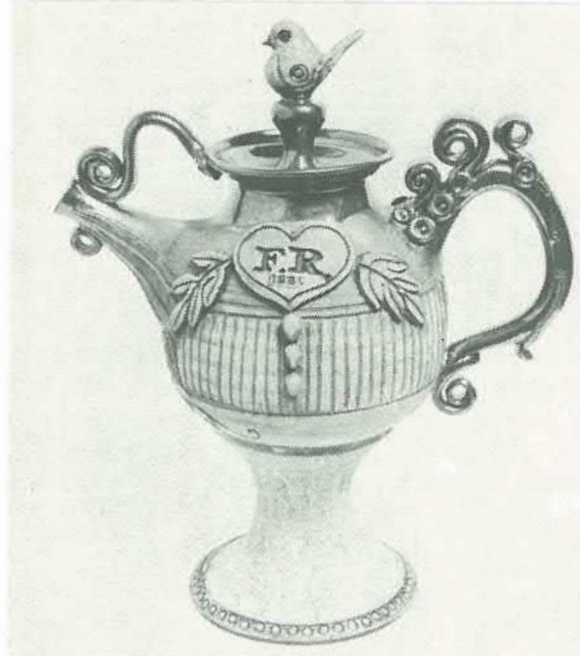
This lively exhibition attracted 123 potters from Invercargill to Kaitaia who produced many imaginative variations on a theme. With characteristic flair for making a good show, Peter Sinclair had Ceylon and Arabian tea plants for sale and the preview guests were served Earl Gray punch.

Left top to bottom: Small two cuppa, shino glaze, Julia Coleman. Jack Davidson, dolomite with iron breaks. Fluted chun teapot, Peter Shearer.
Below top: Merilyn Wiseman white shino type glaze. Below: John Lawrence left, incised linear patterns. Ann Verdcourt's lavender and old lace.

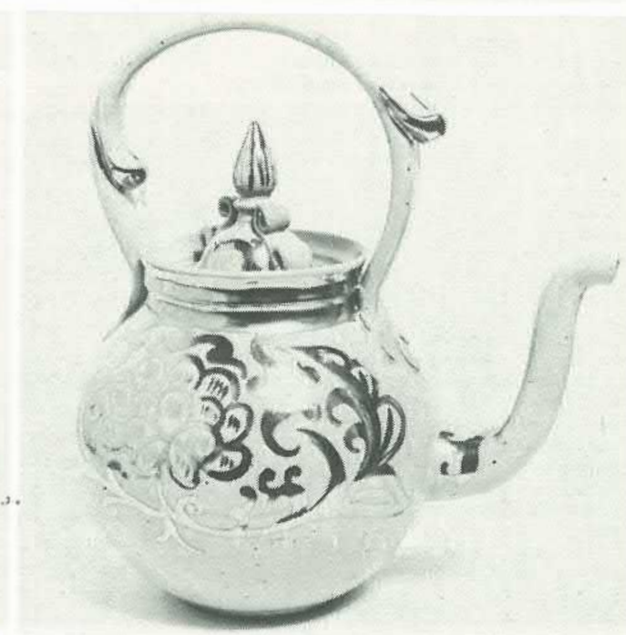






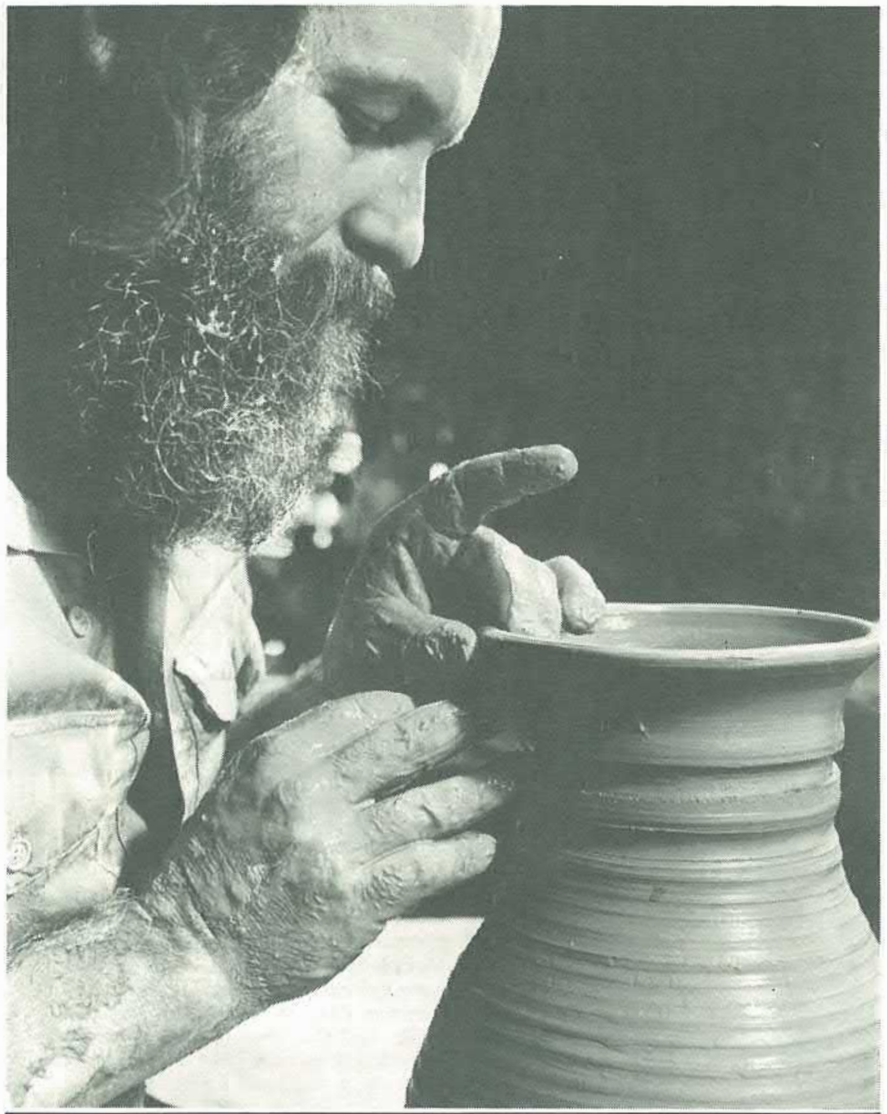


Left: Top to bottom: teapot for a lady, Fairlie Rowe. Fumed porcelain with pink flush, Debbie Pointon. Left: Peter Lange pot with stainless steel handle, mirror black glaze, platinum details and a window design. Nicky Jolly's art deco piece in celadon with lustre lightening flash. Right top to bottom: Christine Thacker, earthenware unglazed inside. Rick Rudd, raku teapot. Granny's bit of Royal Worcester, baroque spoof in white and gold by Jack Laird.



John Green
potter/poet

Besides the usual range of domestic ware, John Green creates ceramic figures — creatures of his imagination. He also writes poetry. He and Muzz Murray combined their talents in a full colour calendar called Groundlevel the 1980 year clock, a page of which is illustrated opposite.



Slake

Loaded
closed
tired and saggared
propped — against the ancient kiln
is Slake
the wedger's son
apprenticed to the village potters
now rests quietly in the sun
kicks at ancestral shards
to depths uncovered
finds inscribed
in cobalt lines
antiquitatems lonely scrawl
of a craftsmans devotion
in other times.

Shard Translation

The Potmaker

Capturing quiet space
in wet vessels —
sits the potmaker
over his ticking wheel,
over the world,
over his clay,
in touch
in love
with what he feels —
the earth
spun into rugged pots
lined left away — in sunlit courts,
young eyes watch at wheel head height,
reflecting the turning days.

Stone pon stone
blocked doors go up,
alined with rising hope,
none but the potmaker
knows of the time,
of the energies,
he must conjure up
in this furious, furnatic climb
with rage that builds
to battle back all hell within his walls,
brushed and chopped ten thousand times
before his powdered glaze — will fall,
— then —
rest — with peace,
the crackle beast
becomes a loyal friend
that yeilds him rich in rugged pots,
to ease back a strength,
the potmaker needs
to help him capture quiet space,
in wet vessels — once again.

John Green

Book review
Shigaraki Potters Valley

Louise Allison Cort, Kodansha, International, Japan. A book for those who appreciate Japanese pottery.

This magnificently produced book is an intimate account of the history of Shigaraki ware and the people who make it.

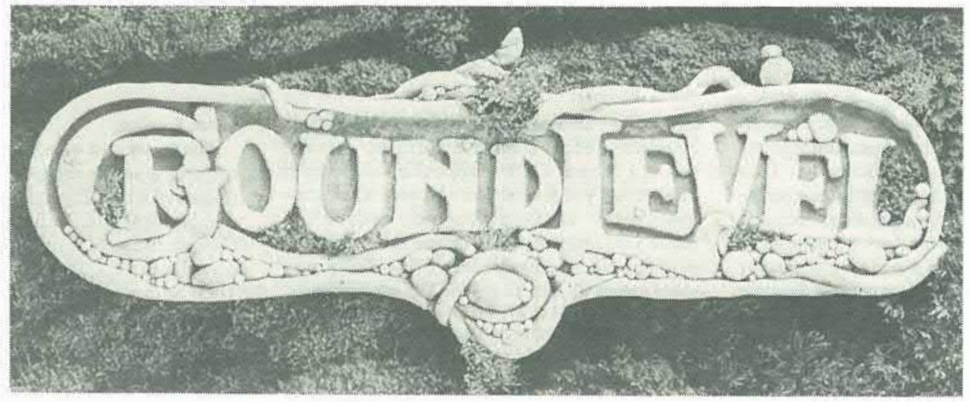
For 700 years farmer potters in this small valley twenty five kilometers from the ancient imperial capital of Kyoto, have made use of the unique clays from the valley to fashion wares ranging from medieval red orange jars with cascades of leaf-green natural ash glaze, to highly esteemed tea ceremony wares. The stylistic development of the ware, and techniques of making and firing still in use today are dealt with in detail complemented by 52 colour photographs and 300 black and white illustrations.

Louise Cort, art historian, craftsman and linguist has produced a work that is scholarly, technical and a rich human document.

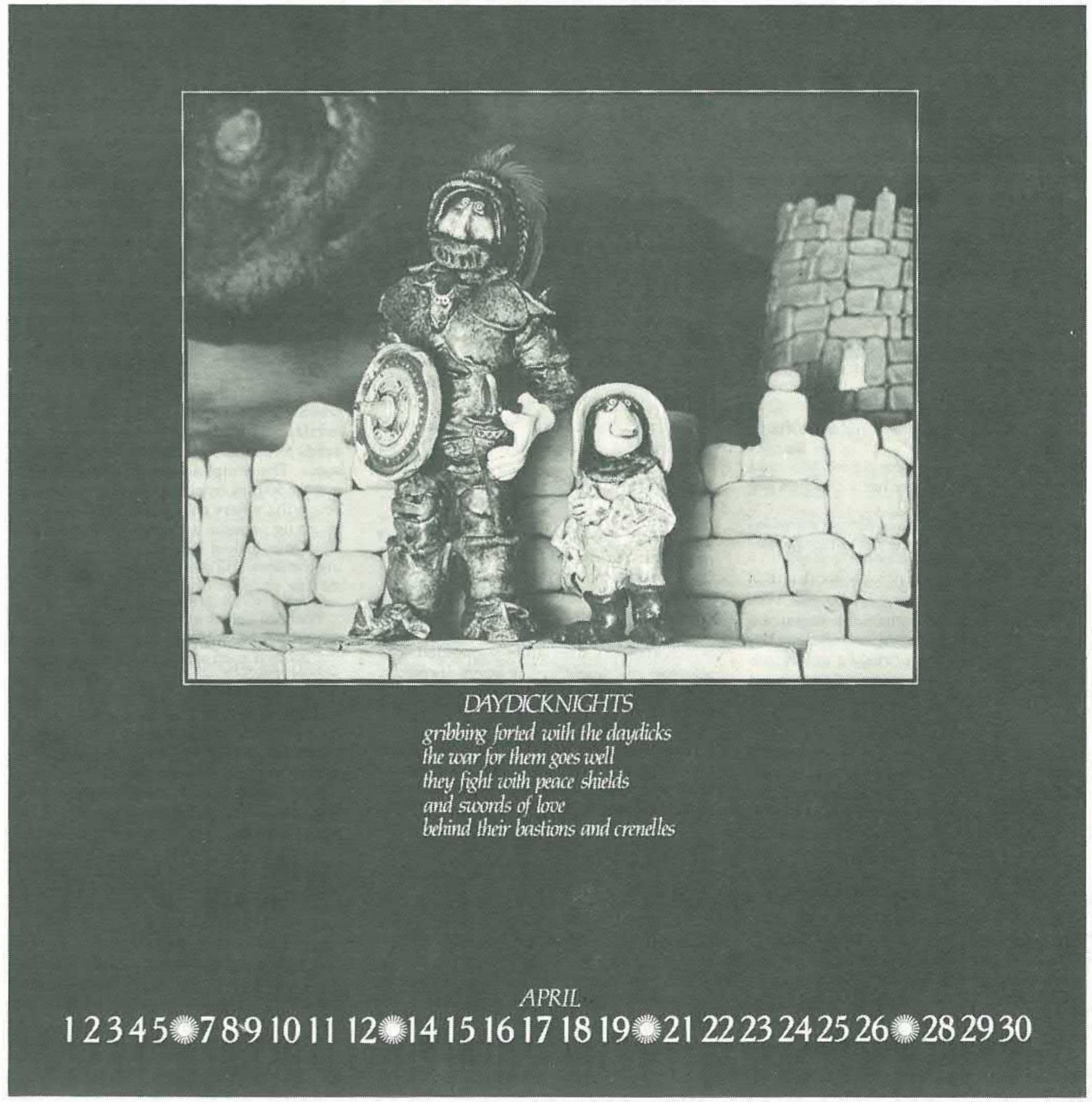
Margaret Harris

PUBLICATIONS

Pottery in Austraila, 48 Burton Street, Darlinghurst NSW 2010, Australia. $A7 two issues.
Studio Potter, Box 172 Warner, New Hampshire 03278, subscription two issues $8.50, in US funds.
Ceramics Monthly, Box 12448 Colombus, Ohio 43212, USA. $12 ten issues.
Ceramic Review, 17a Newburgh Street, London WI £7 six issues.
Potters in Britian, The fifth edition has now been published. Names and addresses of all full members of the Craftsmen Potters Association are included together with a brief description of the type of work they make and an idea of prices charged plus some biographical notes. Copies from Ceramic Review Books, 17a Newburgh Street, London W.I. £ 3.25 (International money order).
New Zealand Whole Earth Catalogue, the first for the 80's to be published by Alister Taylor in October.



Its not too late to catch up with Groundlevel, the 1980 Year Book — a collector's piece if ever there was one. This clayey carrollian calendar created by potter John Green and photographer Muzz Murray, pictures John's fantasy ceramic creatures. Gribbing's journey stretches from January to December. April finds him with the Daydick nights.



Make your own ceramic fibre kiln

Bruce Edmond

Potters who have always made their own kilns are today looking for a kiln that utilizes its energy source more efficiently. This awareness of fuel effectiveness is due to increased costs and availability or rather unavailability of fuel, particulary oil and gas.

The introduction of Kaowool Ceramic Fibre blanket and board has allowed major changes in furnace design and construction to be achieved. Furnaces built of Kaowool are light weight, low thermal mass structures that give significant energy savings when compared with a traditional firebrick lined kiln.

Ceramic fibre blanket is installed in kilns in a layer construction, the blanket being impaled over stainless steel studs. This layer method of construction presents the flat side of the blanket to the heat.

Advantages and Disadvantages of Ceramic Fibre.

Advantages:

- Very low thermal conductivity.
- Light weight.
- Resistant to thermal shock.
- Low heat storage giving improved capacity to support faster kiln cycle times resulting in an improved production rate and lower unit cost for fuel.
- Easily handled and quickly cut with a knife or scissors decreasing construction time.
- Evening of temperature variations within kiln.
- Refractory fallout is eliminated.
- Immediate response to fuel adjustments.
- An all fibre kiln is portable.

Disadvantages:

- Its cost is higher than the more traditional firebrick.
- It has limited use in wood fired kilns and cannot be used on the hot face when salt glazing.
- Progressive shrinkage as temperatures increase to a point where the shrinkage becomes prohibitive
- Low resistance to high burner velocities.
- Possible need to alter glaze recipies.

For those who want the advantages of a ceramic fibre kiln but have steered away because of the cost of the finished article it is possible to make your own fairly easily for approximatley 30-40% of the cost of the manufactured item. The kiln overall internal volume 0.5 cubic metres (18 cubic feet), which I built would cost approximately $1200 which includes the burner system for lpg firing without my own lpg cylinders.

A summary of the procedures taken in building my kiln are presented below. This kiln is a 0.5 cubic metre, front opening down draught kiln fired by lpg. Setting space is on two stacks of 18 inch x 12 inch shelves.

Design

The first task was design. What shape and size to build the kiln and around what burner arrangement; how to position them and how many required. Here I had much assistance from Christopher Cockell of Auckland who had also made his own fibre kiln. His idea was to use only 2 burners, firing horizontally in a down draught kiln. In effect the kiln has a bag wall in that the horizontal flame fires between the first shelf and the floor. This is a gap of 114 mm. On the opposite wall to each burner is a piece of silicon carbide shelf propped at 45° to the wall which deflects the flame up, around and out the flue which is situated immediately above the floor and measures 140 mm high by 230 mm wide.

My burners are diagonally opposite on the sides so that the chimney flue was in fact on the same side as one of the burners. However both burners could be put on the same wall. The only precaution to take is that bricks must be placed between the floor and first shelf to stop the flame taking a shortcut to the flue. Firebricks placed on edge do the job here and also provide support for the first shelf.

The chimney is external. This meant the kiln, being a simple box shape was much more easily constructed. Three of its sides and the roof are lined with fibre. The floor consists of P26 insulating bricks (Kamo Green Refractories). The door was made separately to the same height and width as the box but only 150 mm deep. It is hinged to the box and filled with fibre.

Combustion space between walls and shelf needs to be only 50 mm. The gap between the two shelves can be about 25 mm. So with a fibre thickness of 150 mm the overall dimensions of the kiln frame are 890 mm deep and 860 mm wide. The frame height is 1270 mm with 140 mm of this taken in insulating brick on the floor, 150 mm in fibre on the roof leaving 980 mm of internal height.

Kiln Frame Building.

The hardest part of the whole building process was actually making the metal frame onto which the fibre is supported. I used angle iron for the box and door frame and light metal strips running horizontally spaced at 250 mm intervals vertically. This gave an overall cage effect. The purpose of the strips was to provide a solid support onto which stainless steel studs are welded. The stainless studs hold up the layers of ceramic fibre. So the frame must be strong enough to support the 75 Kg of fibre that makes up the complete lining.

Stud placement should be 250 mm apart vertically and horizontally. For this kiln nine studs were required on each of the five fibre surfaces. Once the frame is completed with studs welded in place a covering of light sheetmetal is applied by rivets or screws. This is simply to offer protection from external damage to the underlying fibre.

An alternative to a frame construction with tin cladding would be a heavier gauge sheetmetal box that is strong enough to support itself and the fibre weight. Studs can then be welded directly to the metal walls by hand welding or by using a stud gun.

With either box construction method welding or sheetmetal bending equipment is required. For this reason it may be easier to employ a fabricating workshop to make the frame to your specifications.

Fibre Lining.

The most cost effective system of lining is to have a series of different grades and densities of fibre. Directly onto the steel casing use 50 mm of L.T. Batts, density $80Kg/m^3$. Over this use 50 mm of Kaowool blanket — normal duty (1260°C), density 96 Kg/m^3. Then 50 mm of Kaowool blanket — high duty (1400°C). The first 25 mm thick layer of high duty blanket can be of 96 Kg/m^3 density but it is preferable to use a 128 Kg/m^3 density blanket on the "hot face" of the kiln. Note: Lower density blankets are cheaper as they contain less ceramic fibre but they are less efficient insulators and not as strong. If desired the L.T. Batts could be upgraded to 112 Kg/m^3 density and 128 Kg/m^3 density blanket could be used on all layers. This would increase insulation qualities but also increase fibre costs. My kiln required approximately $11m^2$ of L.T. Batts, $10m^2$ of 96 Kg/m^3 density normal duty blanket and $9m^2$ of 128 Kg/m^3 high duty blanket, all of 25 mm thickness.

Normal duty blanket although given a maximum temperature range of 1260°C in continuous conditions should not be subject to temperatures of more than 1175°C in intermittent reducing atmospheres. The fibre itself has a melting temperature in excess of 1700°C but above 1175°C the percentage rate of shrinkage is too great to ensure integrity of the lining. The service temperature limit for high duty blanket in reducing intermittent kilns is 1325°C. Shrinkage of the high duty blanket at this temperature is around 3-4.5%. To overcome the effects of fibre shrinkage two steps are taken. Firstly the hot face layer of blanket is overlapped with the adjacent strip. This overlap needs to be positioned at a row of studs. The complete overlap should be 100 mm or 50 mm from each of the two strips. Secondly, where a length of blanket is used in going around a corner plenty of extra blanket is tucked into the corner. Upon firing the fibre will shrink and fill the corner to its true shape.

With all layers of fibre in place impaled over the studs a 15 mm diameter hole is cut out around each stud to a depth of several inches. I found an aluminium cigar cannister ideal for this job. A ceramic cup is then slid down the hole over the stud and twisted on to the stud thus securing the fibre in place. To protect the protruding end of the stainless stud from high temperatures scraps of high duty blanket are packed into the ceramic cup. Burner ports, spy holes and flue can easily be cut out with a hacksaw or sharp knife. It is also a good idea to mould a piece of high duty blanket around these holes to protect the exposed layers of lower blanket from temperatures which cause excessive shrinkage.

The base of the chimney is simply a pile of bricks four courses high into which a damper is fitted. On top of this a tube, lined with a 1¼ inch thickness of Kaowool normal duty blanket is secured. (This requires a further 1.5 m^2 of 96 Kg/m^3 density blanket for each 25 mm thickness, depending on the height of chimney — about 1 metre.) The brick arrangement could be improved on but I found it cheap, simple and quick to assemble or dismantle.

Firing System.

Prospective kiln builders may have their own preference for burner systems. This kiln had a very simple system whereby each burner is connected to its own gas cylinder. This meant 2 regulators, 2 lengths of hosing and 2 pressure gauges were required. One only of these could be used with slight modification. An automatic cutout on the burners is really the only safety device needed. This stops gas accumulation and possible explosion in the kiln if the flame is blown out. Burner size is 25 mm with gas jets drilled out to a diameter of 1.5 mm. The jet diameter was found to be that required with just two burners for a kiln of this size.

The burner system permitted a very simple firing pattern. Primary air intake on the burner is left full open throughout the firing. Fuel input is increased using the needle valve. This increase is registered as an increase in kilopascals on the pressure gauge. To reduce, the damper is simply pushed in. Sometimes as little as 6 mm is all that is needed to gain reduction. Firing time can be almost as long or short as one likes. Fuel is not having to be used to heat up dense refractory therefore a rate of heating can be achieved which is only dependent on the ability of the ware to withstand such a rate.

At the desired temperature of 1300°C, the outside metal cladding temperature was up to 90°C. There was virtually no temperature difference within the kiln.

With glazes modified slightly for gas conditions my kiln produces the desired results but with significant advantages. Probably the greatest single advantage over a brick structure for me is its portability. With help from a few able bodied people I can lift the entire kiln onto a trailer and take it anywhere. Ideal for those with a less permanent place of residence.

Other Forms of Uses of Ceramic Fibre.

There are many forms of ceramic fibre which can be used by potters in existing kilns. One of the most recent is the Kaoclad Tile. The introduction of a fibrous tile, Triton Kaoclad Ceramic Fibre Furnace Veneer, has overcome some of the limitations of ceramic fibre and allowed fibre to be used more successfully in furnace rehabilitation work.

The tiles come in three temperature ratings, 1200°C, 1400°C and 1600°C. Each grade can be used up to its stated temperature limit which is not normally the case with the layered ceramic fibre blanket structure. This Kaoclad tile is cemented on the inside of a brick furnace to transform it to a low thermal mass unit. The cement is an especially designed super duty refractory mortar which gets around the problem of using mechanical fixing methods.

Ceramic fibre wickets are ideal for saving time in bricking up, giving a lightweight door, reducing fuel use and providing a perfect seal. Heat loss around the wicket is reduced eliminating that possible "cold spot" in the kiln.

Blanket or L.T. Batts can be placed on the outside of the kiln to reduce heat loss. Seals on existing electric kilns doors can be improved with the addition of a layer of thinner blanket, 6 or 13 mm or even paper up to 2.5 mm thick. Bulk fibre can be stuffed into gaps between bricks or in expansion joints. Board can be used as back up insulation to a dense refractory floor.

The applications for ceramic fibre in its various forms could go on and on. It is a new material for which new applications are being found everyday. With the advantages to be had from its use the naturally inventive potter will find his own applications as well.

Bruce Edmond built this kiln in Auckland where he was a representative of Kamo Green Refractories and a member of Auckland Studio Potters group.

Honour from Italy

In January, I wrote to the Craft Council about the advertised International Faenza Competition for ceramic tiles. When the brief arrived, I found that the required design was for a floor, or wall lining, freely set, with a maximum of 3 colours; not a design for an individual tile, as I had supposed. I've enjoyed designing and carving ceramic tiles for a long time, for use in murals, tables etc. This design used plain Italian tiles. An interesting exercise, requiring:

(a) An orthographic projection drawing, scale 1:20, the size of tiles expressed.
(b) Perspective sight of the whole environment with details of work.
(c) The three colours chosen added by tempera or transferable colour screens.

I decided to do a wall design, using two sized tiles 20 cm and 10 cm square, and chose black, white and dark terracotta, as my three colours, matt black and white glazes and unglazed textured terracotta, the grouting in the same colours. Then I spent some time painting and cutting paper in strips and putting it together until I was satisfied with a balance. I envisaged bands of large blocks of colour, interspersed with thin varied bands of colour, design related, with heaviness on the left.

Asked for an environmental layout, I chose to run a very high white sloping ceiling into the designed wall. A white textured wall on left led into the tile design, and a floor to ceiling window wall on right. A dark charcoal black carpet joined the whole thing together.

I then had a small alcove room, with the end wall completely tiled, in block strips of colour, which I felt would be a good environment for a quiet reading room in a library. So I drew in children lying on the floor, reading, a bean bag or two in black and white, and white moulded tables.

My own feeling is that black is a silence colour, white is light, and terracotta earthy and basic.

A marvellous two days followed, training my eyes over a measured drawing, painting, lettering and perspective. It is years now since art school and map draughting training in Lands & Survey Department, and my eyes are not the same. Nevertheless it was fun and I enjoyed myself. Quickly I posted it away and forgot to take a photo or copy.

There was great excitment two months later when an all Italian letter arrived, that I could'nt read a word of. Translation, and more excitement. I'd won one of the five 200,000 Lire prizes. Such elation for me, living simply, in an early colonial farm house, on our Northland goat farm far away from Faenza. Elation, not only because of the prize, but because in Italy they had chosen a New Zealand potter's design; a simple design, in what I believed to be three basic New Zealand colours — something from my own country.

Madeleine Dashper

Oswold Stephens 1897-1980

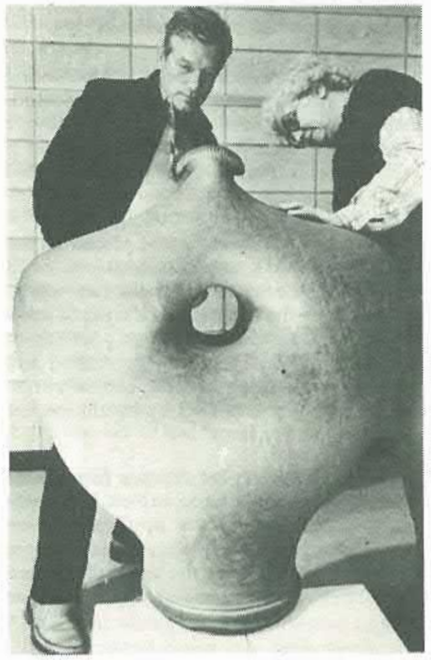
Oswold Stephens New Zealand pioneer potter died in May last in Dunedin at the age of 83. After graduating from Otago University with a first class honours degree in chemistry, Oswold joined in 1926 the firm of New Zealand Insulators Ltd at Temuka as a glaze chemist. Thus began his first acquaintance with clay and pottery. He later became head of the science department of King Edward Technical College in Dunedin.

Oswold was 37 and from this time on pottery became his consuming interest. He wanted others to share this creative experience. He wanted teaching courses established. He wanted potters up and down the country to know each other and share their knowledge as he shared his. To this end through the Visual Arts Society, he organised the first New Zealand national pottery exhibition in Dunedin in 1957 and this became an annual event.

The visit of Bernard Leach to New Zealand in 1962 was a highlight of his life. He was able to meet a man of about his own age who had become a world figure in craft pottery.

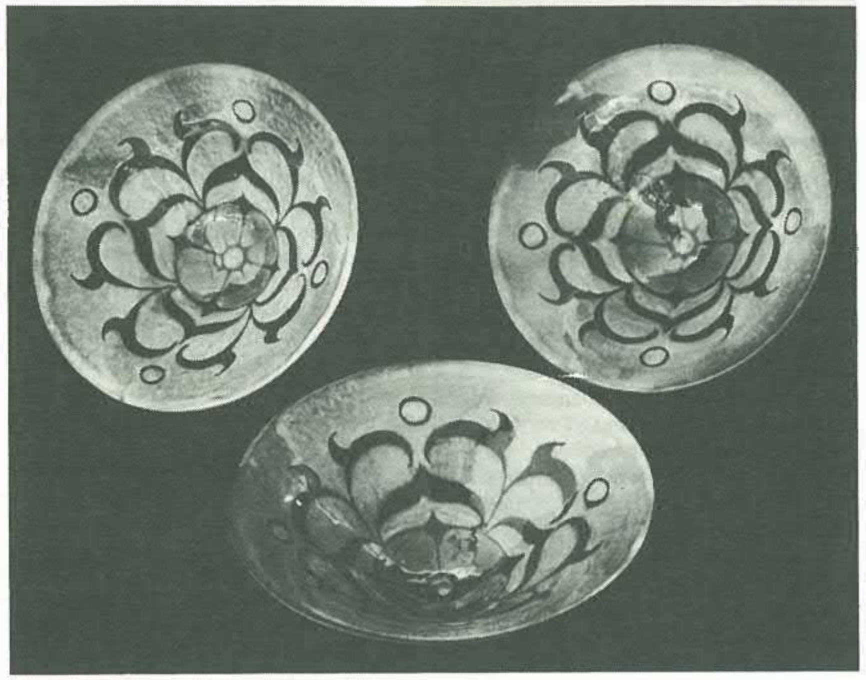
Doris Low
Dunedin

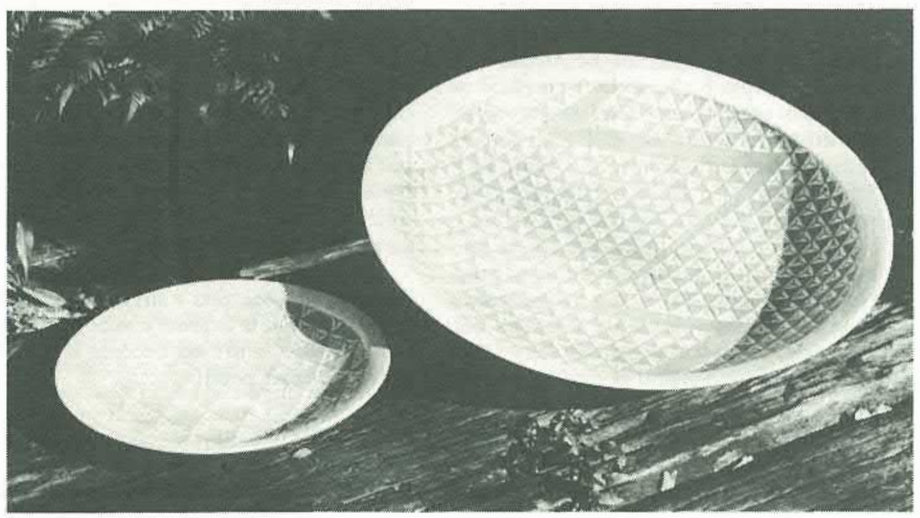
Exhibitions



Coiled terra cotta holomorph, a recent work by Barry Brickell exhibited in June at the Dowse Art Gallery Lower Hutt. Then and now, was the theme of the exhibition. The intention was to display the gallery's permanent pottery collection established over the past 10 years and selected from a range of work from leading New Zealand potters. All exhibitors were asked for two extra ceramics representative of current work. This was an interesting idea which could have made a notable exhibition. Disappointingly the new work presented, reinforced the concept that most potters are playing it safe and there was little progression from then till now. Some potters are finding new challenges with salt glazing, others are extending technique in porcelain. Barry Brickell and George Kojis stood out as potters prepared to risk glorious failure, enlivening the show with really adventurous pots.

Right: teapot from Ian Smail's exhibition at Albany Gallery.





Above: some of a range of finely thrown bowls in terra cotta with decoration painted and sprayed. These bowls by Barry Ball were from Ian Firths Pottery Shop, Birkenhead.

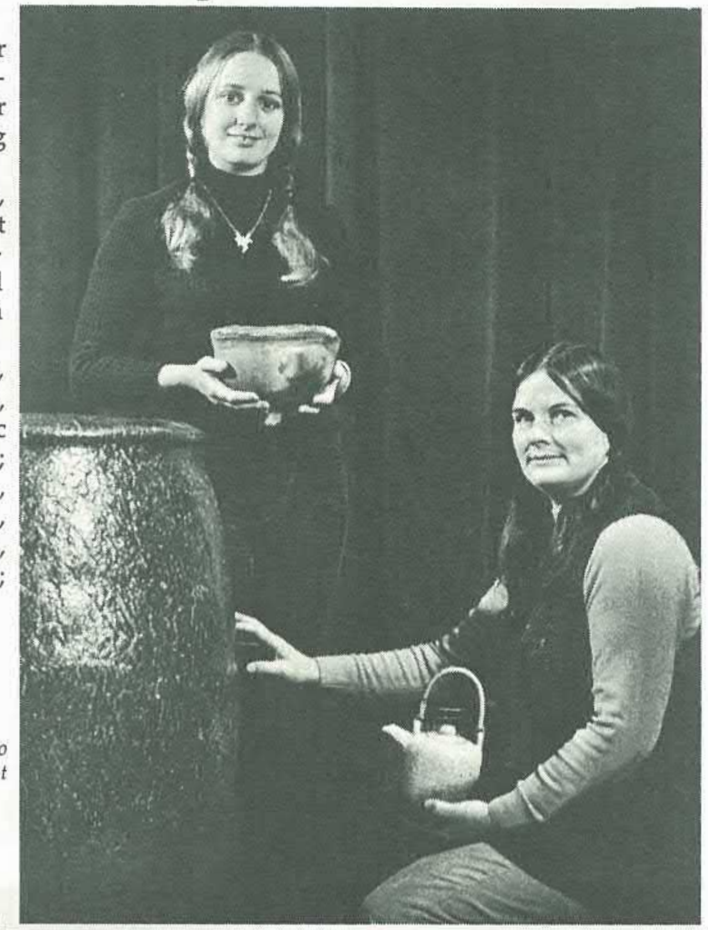
Left: examples of work by a Japanese potter shown at 12 potters, Remuera. Itsumi Itoh from Kyoto has been working in Margaret Milne's studio.

Fletcher Brownbuilt Pottery Award 1980

This years pottery award sponsored by Fletcher Brownbuilt attracted worldwide entries. Debbie Pointon, from Kapiti Coast took the $2,000 award with her wood fumed porcelain bowl from 166 entries including 29 from overseas.

Sole judge, Robin Welch a leading English potter, who has exhibited in many countries said his short list was representative of the highest international standards and it was his preference for the pot he would most like to add to his own collection that made him choose Debbie Pointon's entry as the winner.

The list of merit awards is: Loraine Clark, Coromandel; Sue Clifford, Wyndham; Katie Collie, New York, USA; Julia Coleman, Auckland; Vic Greenaway, Australia; Jean Hastedt, Paraparaumu; Peter Hawkesby, Auckland; Sharon Kennedy, Waiheke; Kathrin McMiles, Australia; Stuart Newby, Auckland; Peter Oxborough, Warkworth; John Parker, Oratia; Rick Rudd, Auckland; Neil Tetkowski, USA; and Ian Smail, Albany.



Debbie Pointon left, holding her winning entry and Jean Hastedt who won a Merit Award with her Shino teapot share a workshop at Paraparaumu. Alongside, a storage jar by Mathew McLean.

Photo: Steve Rumsey

Below: Merit Awards for Peter Oxborough and Jean Hastedt.

Photos: Hill photography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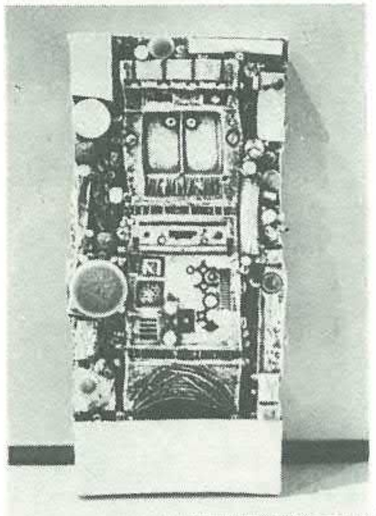
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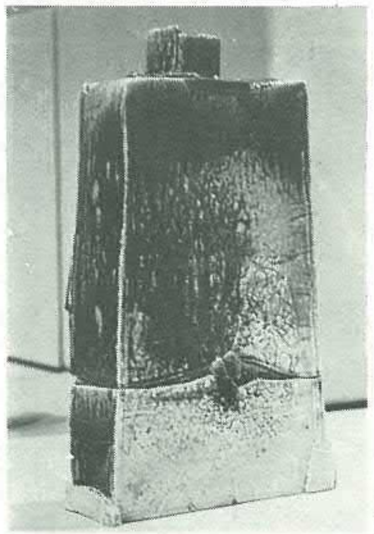
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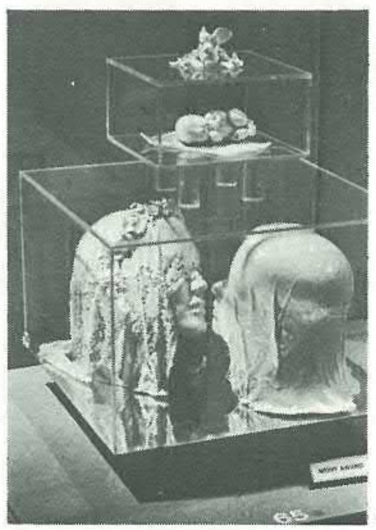
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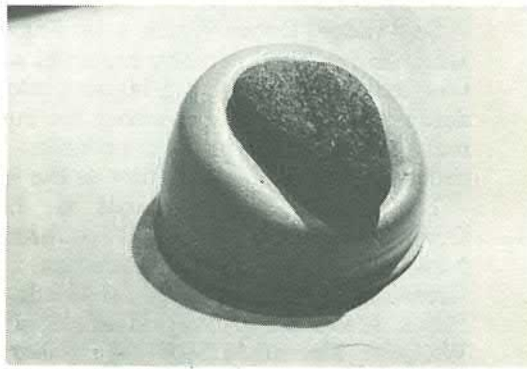
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Some exhibits from Fletcher Brownbuilt Award

1 Ban Kajitani, USA "white canyonland".

2 Ted Dutch
"ancient King" porcelain

3 George Kojis
bottlescape # 2

4 Kathrin McMiles, Australia.
earthenware

5 Itsumi Itoh
brush design on stoneware

6 Loraine Clark
lily vase wood-fired stoneware.

7 Kim Martin-Potter, Australia
"Oberon Bay"

8 Gary Elliott, vase

9 Stephen & Zoe Carter

10 Mark Jorgensen, USA
stoneware and rock

11 John E. Parker
bronze bowl

12 Stuart (John) Newby
bowl, wood fired.

13 Peter Beard, England
porcelain flower disc

14 Peter Hawkesby
white & black porcelain teapots.

15 John Dermer, Australia
salt glazed blossom jar.

16 Julia Coleman, jar

17 Bronwynne Cornish
"within: without" porcelain.

18 Kate Collie, USA
raku fired bowl

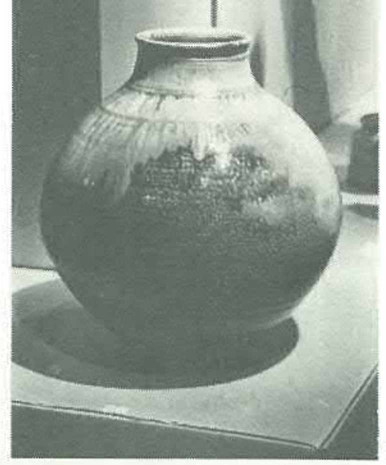
19 Lex Dawson
raku jar

20 Mathew McLean Catherine McLean
storage jars

21 Andrew Van Der Putten
bottle

22 Ian Smail, jar.

photographs by Steve Rumsey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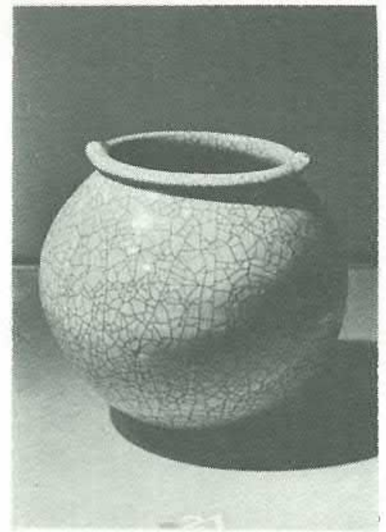
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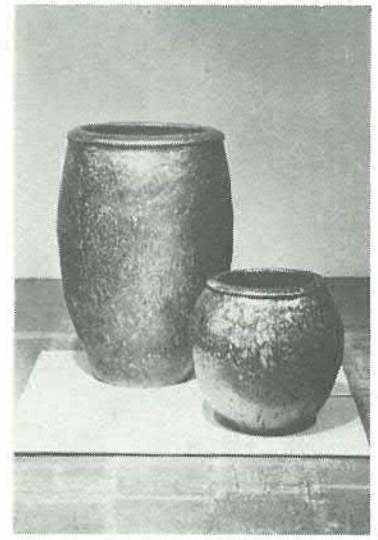
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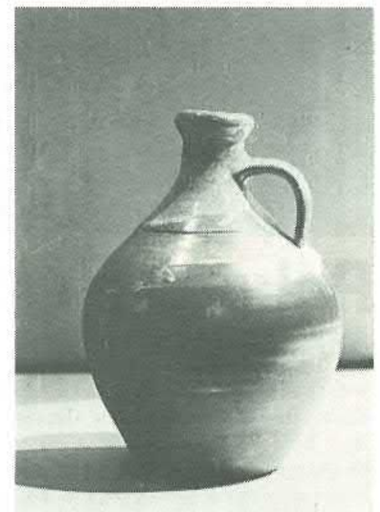
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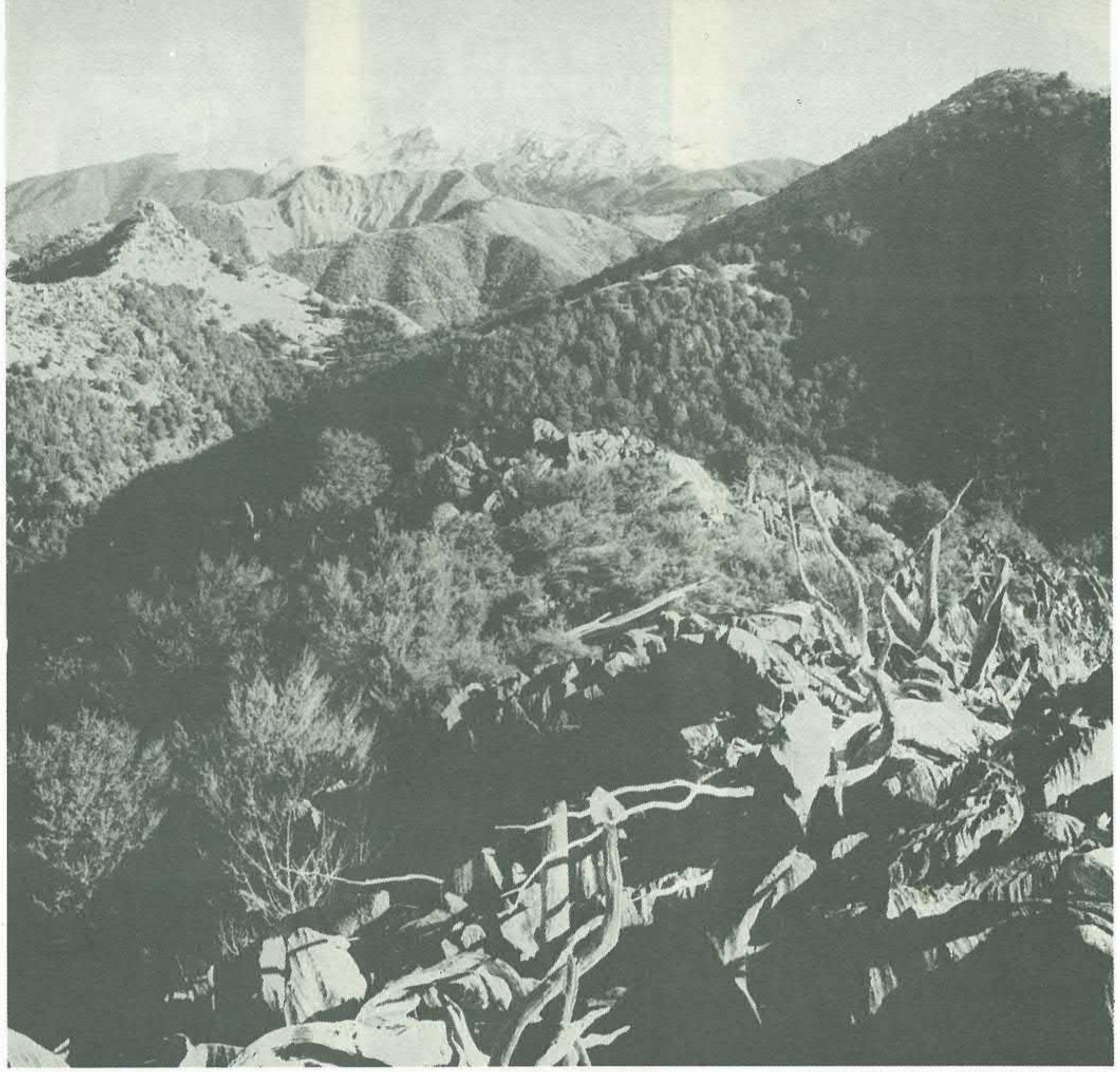


At the top of the hills – Pokororo Scenic Reserve. Paleozoic marble outcrops weather to striking sculptured forms. Regenerating Kanuka and beach forest, Mt Arthur beyond

Pokororo craft fair

Thirty-five miles towards the ranges west of the city of Nelson the Motueka River flows through rich alluvial valleys to Tasman Bay. On a customary brilliantly sunny day in early January, holiday makers are drawn to Pokororo on the west bank of the river to a crafts fair that is a regular event. The fair has been so successful that similar events are emerging in other Nelson districts.

The fifth annual Pokororo Crafts Fair, as in past years, was a great success. Although the advertised opening time was 10.00 am, the people eager for the best selection began arriving as the exhibitors were setting up their displays and some items were sold as they were unwrapped. By 10.00 am the place was humming.

Although called a crafts fair, Pokororo is primarily a pottery sale. This year there were five contributing potters all living locally. They were Jon Benge and Gill Gane, Kathleen and John Ing, Bill and Nancy Malcolm, Stephen McCarthy and Liz Stucke. We also had work by two painters, two weavers, a maker of wooden toys, stuffed toys, herbs and plants, Malaysian filigree silver and two local groups selling produce. Always welcome are the tea and sandwiches offered by the Pokororo Women's Country Club. Pulling it all together for the past two years and creating the right tone has been Nick Brown providing country blue grass music on his fiddle.

How did the fair come about in a remote place like Pokororo. Six years ago a couple of the professional potters in the district were sitting together discussing life in general when the thought arose that very few of the locals (farmers), knew what we were doing out here to earn a living. For fun we decided to put together a show to demonstrate that it was possible to make a living from handcrafts and cottage industries in the countyside.

We chose the Pokororo Hall as the venue because it was in the centre of the district we were representing and for the picturesque beauty of the location. Situated 17 miles from Motueka at the confluence of the Graham and Motueka Rivers, the hall sits on a grassy knoll surrounded by bush. The Mt Arthur Ranges loom up behind, creating a dramatic landscape that would be hard to match.

We held the first fair in mid January thinking that some holiday makers might find their way out as well. What happened surpassed our wildest dreams. Never before has so many cars and people descended on the area at one time. The locals were amazed.

So the Pokororo Fair has developed and evolved. Most of the exhibitors are from the original group, but there have been some changes and variety in the work available.

For those contemplating a fair along similar lines here are some keys to success based on our experience.

Pottery is the main draw to the show.

Be sure that those taking part work to good standard. Potters who already have a reputation in the area will attract people to the show. The potters need to provide variety and have plenty of stock on hand because a skimpy display will not encourage people to return next year.

Chose a location where there is ample room to spread displays and if possible, one that offers some kind of recreation; fishing, swimming and scenery to make an additional reason for making a lengthy excursion into the countryside.

A variety of arts and crafts displays widens the spectrum of interest.

Advertise. Take advantage of any free advertising, such as local holiday brochures, the Listener Arts Diary, an interview on the local radio station. For Pokororo we have made up reusable signs using a recognizable logo and lettering that we place in shop windows and at sign posts along the routes to Pokororo. Each year we print 1,000 handouts for placing in camp grounds, tourist offices and other places holiday makers frequent. Its most important that advertising is professional looking (in whatever way it is designed), and informative. If you don't make a good impression initially there will be the feeling that the standard of your show may not be good.

It would be an idea to confer with other groups running similar events before settling on dates.

For further information and first hand experience of a fun crafts fair see you all at Pokororo in 1981.

Notes from a Pokororo pottery

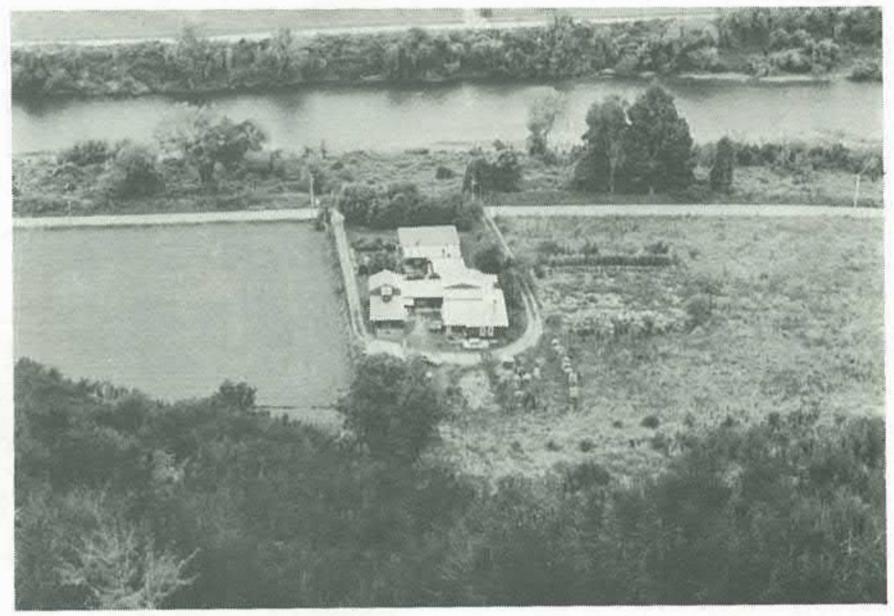
John Ing

When the estate agent told us there was a run down tobacco farm for sale along the Motueka River we were sure it was meant for us. We bought it, named it Koa Mahi (Happy Work), and started making it our own. We felt we'd never be able to use all the shed space, but we learnt you never have too much.

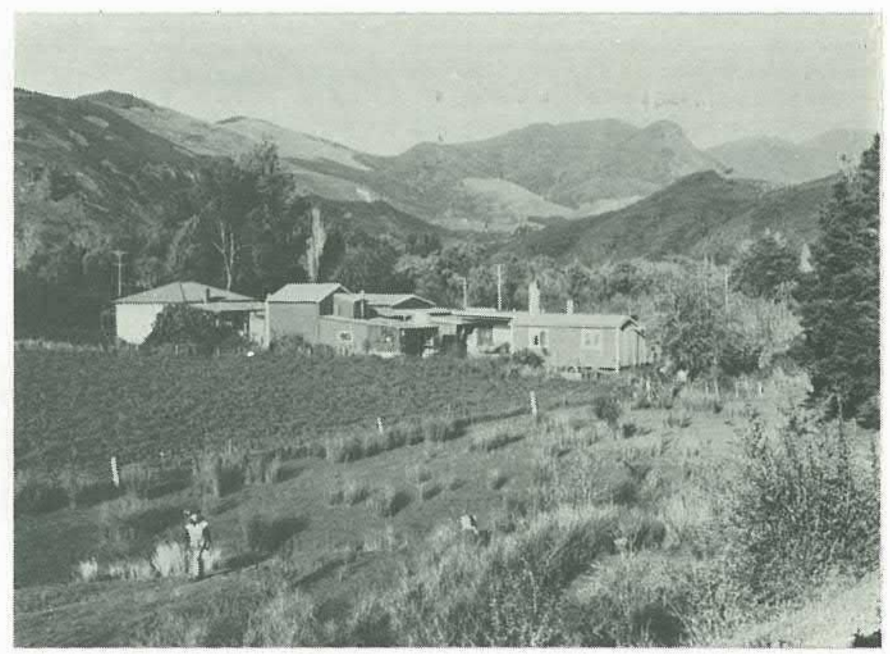
The grading shed we turned into a bright studio by adding a wall of windows, and some clear plastic roofing panels. The bulk storage shed made a showroom with again more windows, roof panels and display shelves. The coal storage and stoking shed (bunk house) was the home for our first kiln, 42 cubic ft natural draught oil fired, with bisque chamber. After several years of mediocre results we converted the kiln to four pot burners which evened it out beautifully, increasing our stacking space by 29% and decreased the oil consumption by the same amount. Our next kiln was an oil fired catenary arch salt kiln — first with louvre burners later converted to pot burners. Although this kiln never became the workhorse our stoneware kiln has become, we have greatly enjoyed the hundreds of salted pots from it. It would seem that the life of the salt kiln is nearing its end, as many of the salt drip beauty marks on pots are now bearing bits of brick, spalling off from the arch.

Our newest kiln is a 100 cu ft wood fired trolley kiln with a chimney that is tapered from the 3½ ft x 6 ft bisque chamber base to a 16 inch x 12 inch opening some 18 inch from the floor. The door to the glaze chamber is a fibre blanket in a stainless steel frame which is hinged to the steelwork on the top or the kiln. The door is raised and lowered by a pulley system.

We fire the kiln with pine slabs from a local mill but have planted our own future fuel. The firing to 1300°C takes a little over 12 hours which includes a two hour soak, and the temperature is beautifully even, though the bisque tends to be too hot.



Koa Mahi Pottery on the west bank of the Motueka River, Nelson.



The firebox arrangement is somewhat different to other wood kilns we've seen as the two fireboxes are inside the kiln with a bagwall between them and the ware on the trolley. Each firebox is 4' long and has eight 4½" x 3" air holes to provide the oxygen. The primary airholes are located below the grate and the air is pre-heated by passing over the coals in the ash pit, while the secondary air comes in above the grate. At top temperature we find it best to have all air full open.

As we gain experience firing the kiln, it becomes easier and easier. but the first firing was a real experience. Near the end we had seven people working flat out. Two stoking the fireboxes at a furious rate, two were keeping the air holes open and two alternately raking out the ash pits. The seventh was barely able to keep the beer mugs full for the other six. No more wood firings in mid summer. But what a beautiful firing — the best we'd ever done in any kiln.

As is the potter's way we have set about to tune and refine the kiln over the subsequent five firings. We can now easily fire with four eager workers on hand. One person can handle both fireboxes up to 800°C but after that the stoking rate increases to the point where each firebox requires a full time fireman. After about 1100°C, the wood is burning at such a furious rate that someone must keep the air intake holes clear right through to the end. Its a kiln that requires a lot of attention, but all who participate in the firing agree that there's a sense of communion with the fire that makes the effort especially rewarding.

Since the wood fired kiln is quite a lot larger than the oil kiln, our work cycle is stretched out to three weeks. For about 10 days we make pots — mostly wheel thrown domestic stoneware but some hand built non functional or porcelain — for a kiln load. The next week flies by in preparation for firing and three days at the end of the week for glazing and decorating. We stack, do a glaze firing, open and grind the work, and price the pots on four successive days. We then hope to have a few days to contemplate the pots before a shop takes them away. Its a very high energy and enjoyable three weeks which gives us much satisfaction — especially at kiln opening time.

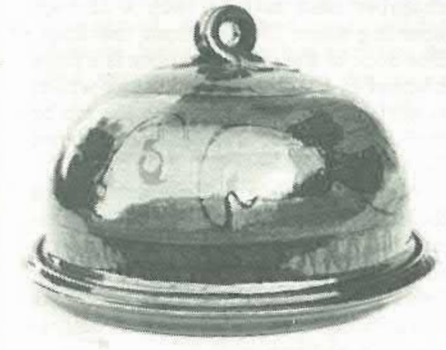
And the larger cycle of our life is equally pleasing. We tend to work at making pots about nine months of the year, and spend winters doing something else. We found to our dismay that unless the studio is heated at night in winter, the frosts can be disasterous. The early morning frost ice lacework in the wet pots although beautiful causes them to collapse onto the floor as the room warms up. Sometimes its jobs to maintain some order around the place. Some winters we've planted trees . . . to date there are 500 hundred nut trees (walnuts, almonds, and hazelnuts), 2000 natives and 1000 pines. Or some winters we travel, usually with some pottery seeking objective.

Our life here is busy but simple. Our location remote and beautiful and it feels just right. We hope our pottery is a reflection of our environment and lifestyle. Our goal is to make pots that can be used and enjoyed every day.

John Ing
Koa Mahi Pottery and Handweavery
R.D. 1 Motueka

John and Kathleen Ing developed a rudimentary knowledge of potting when working in San Franscisco with computers and business management. "We decided there were other areas of life we should investigate so we sold our belongings and hit the road. A journey that was to cover a great amount of distance and experience, finally ending up in New Zealand. We had no firm plans of how we would earn a living, but I had hoped that making pots could at least be a profitable hobby. To find so many people were earning a living, made me optimistic about being a potter so we decided to give it a try".

Wood kiln trolley stacked, door pulled up by rope. Wine jar and stand by John, goblets by Kathleen. Bowl 16 cm, and cheese dish 20 x 24 cm, all celadon glaze wax resist decoration.

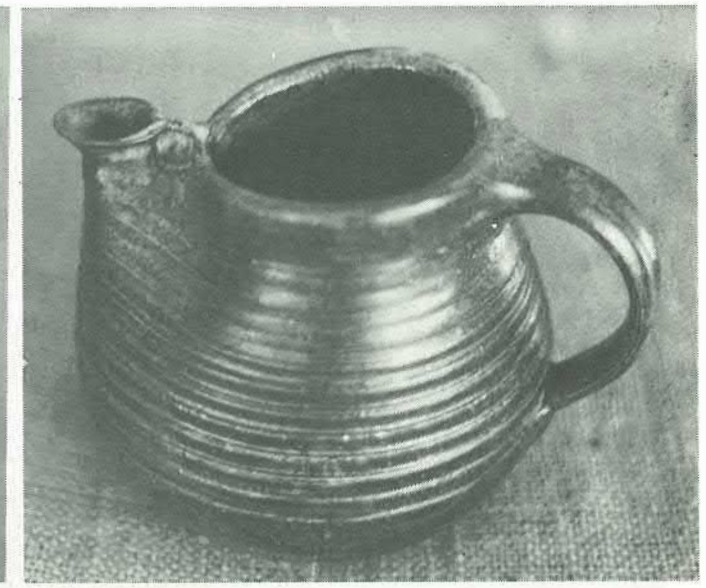


Liz Stucke

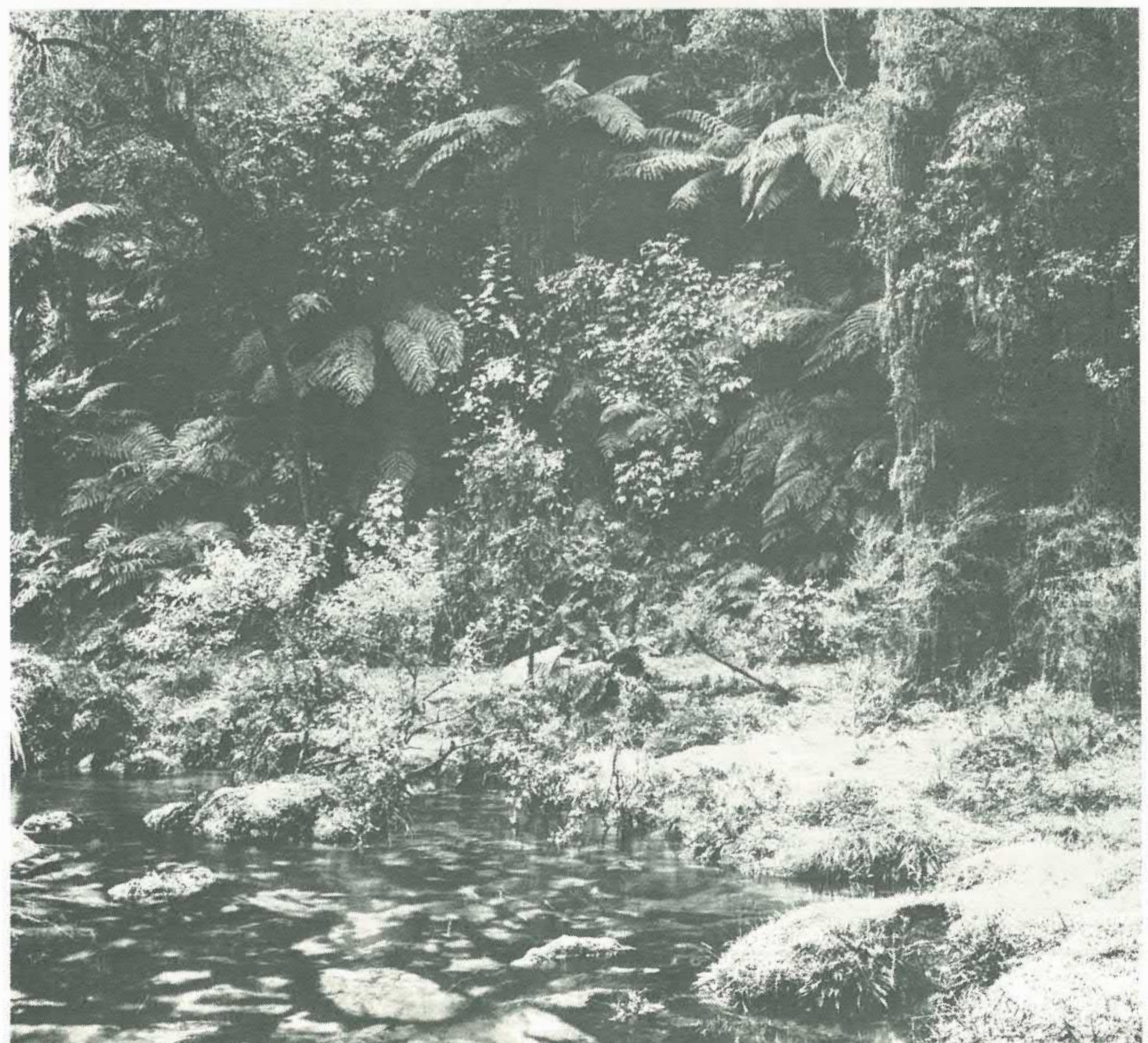
Domestic stoneware potter. My only ambition is that my pots will belong to someone who really enjoys their stew from my casserole, or their coffee from my mug or their African violet housed in a homely pot more, because of them.

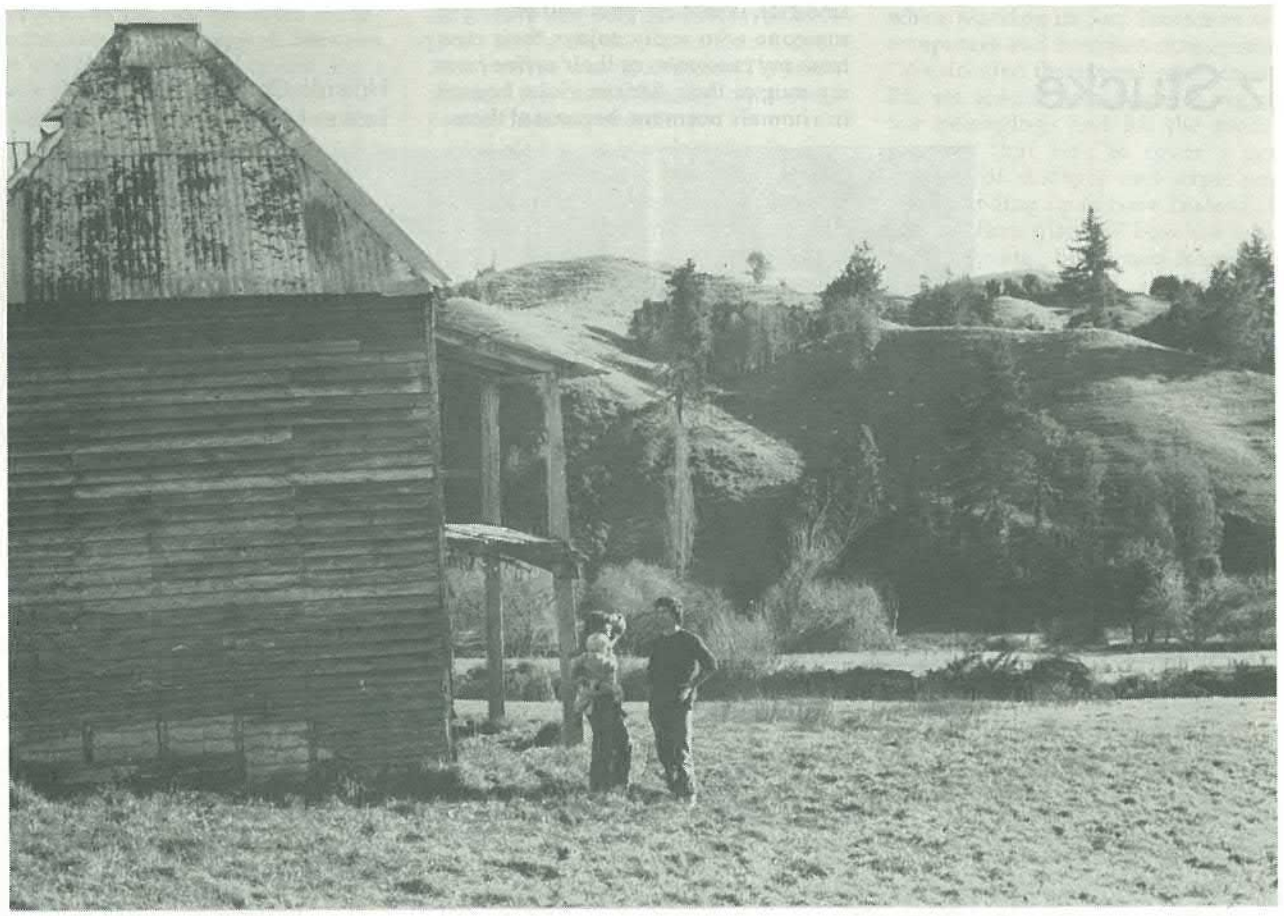
Hillside Orchard Pottery,
Lower Moutere, Nelson.

Jug 6" high, ash iron and manganese glaze. Bottle 14" high with the same glaze.



At the bottom of the hills, Riwaka. Crystal pool surrounded by marble boulders, Kahikatea and broad-leaved forest. Photos: from Scenic Reserves of Nelson, Published by Lands and Survey





Gill Gane and Jon Benge

Jon left school to take up a position at Waimea Craft Pottery workshop at Richmond, Nelson, rather than go to university and was soon converted to the potter's way of life. He remained at Waimea for four years, then in 1979 established Valley Pottery at Neudorf near Motueka.

I spent two years at Ilam Fine Arts School, Canterbury University, followed by a year at Supergraphics, Wellington and four years overseas spending a lot of time looking at ancient and modern pottery with the idea that I would like to work at craft pottery on my return home. I got that chance when Paul Laird offered me a job at Waimea Pottery.

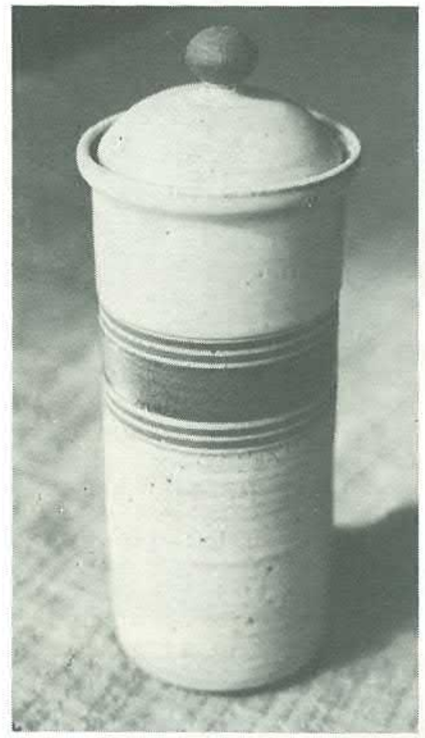
Jon produces most of the pots which are all thrown, biscuit fired, and glazed in two base glazes. I brush decorate applying oxides over glaze.

We fire with two small electric kilns. Its early days yet. We are concentrating on developing our range of domestic ware, but look forward to the future with enthusiusm and the next step is to build a small wood fired kiln.

Most pots are sold to retail outlets. We've been to Pokororo twice now. The sale day-fair atmosphere is exciting. We've established a buying selling relationship with people from outside Nelson. Some even helped us to unpack the pots. We hope our Morrie Minor makes it next year.

Valley Pottery
Neudorf, Nelson

Left: Buildings from the hop and tobacco industries part of the Motueka landscape, on Gill and Jon's property at Neudorf.



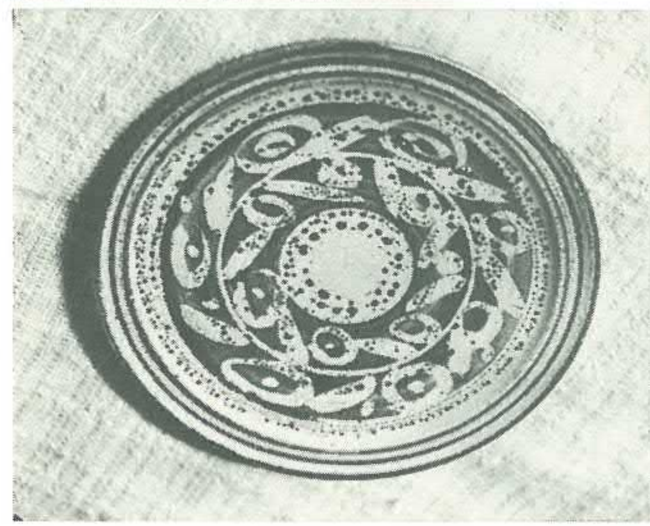
Stephen McCarthy

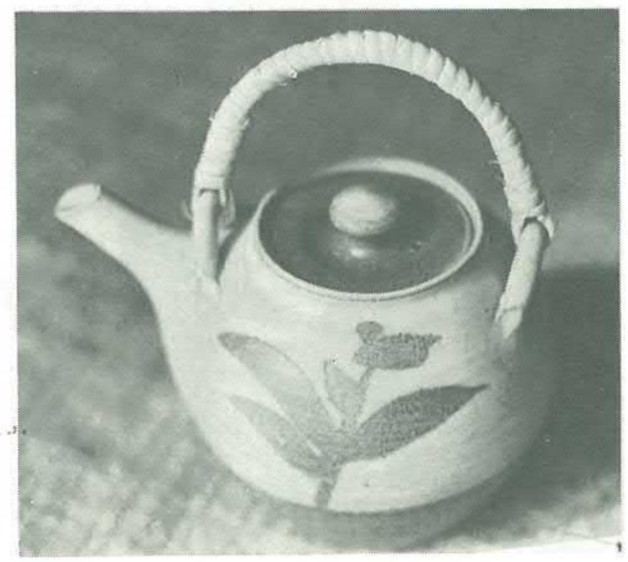
After making stoneware at Waikanae for eight years I moved down to the Motueka Valley and set up a pottery at Woodstock. Here I found other craftsmen working and a group of us decided to have a crafts fair in the Christmas holiday season. I make a range of domestic ware and have a big planter output.

From Stephen a warning. Watch out for this cone 10

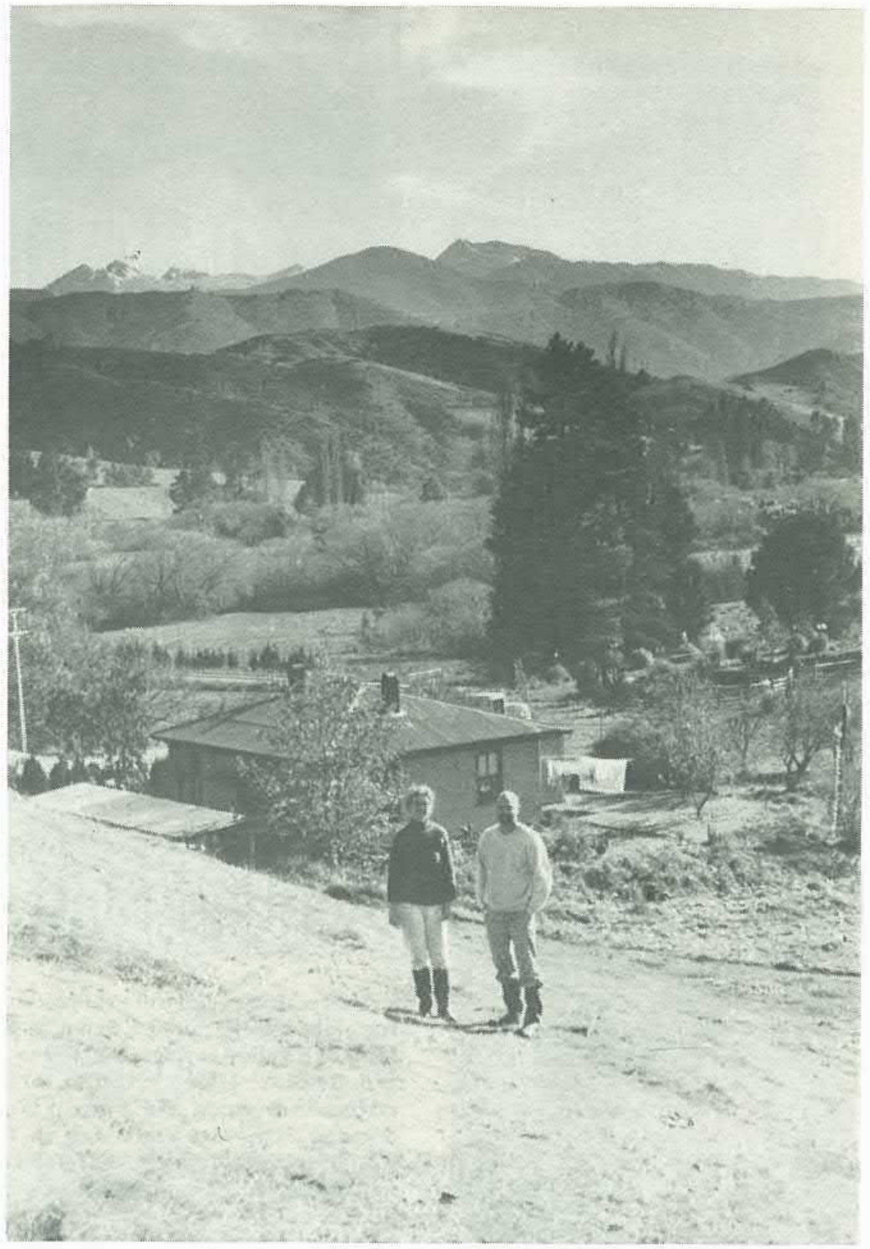
"We have just had the most ghastly firing imaginable. A dud box of pyrometric cones was responsible and nearly the whole kiln load had to be smashed off the shelves. What a ... mess. Harrison Mayer cone 10 batch 10 B should be treated with caution. It may save somebody else $1500".

Woodstock Pottery
RD2 Wakefield, Nelson



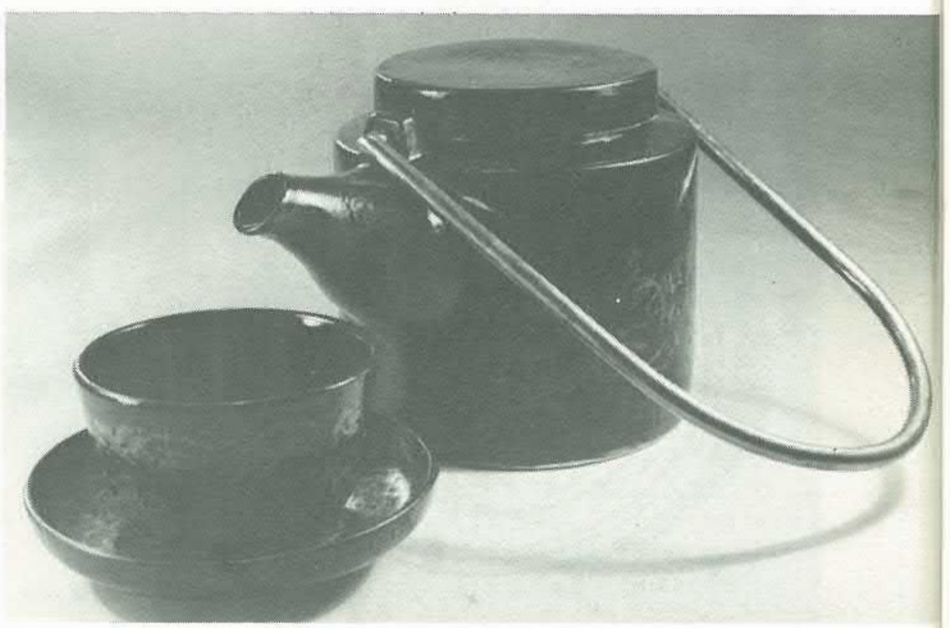


Nancy and Bill Malcolm



We started out making only raku, but in the last couple of years have got right out of it. The firing hazards, limited markets, and fragility of the ware were factors in our decision. However, the stoneware we're now making is much influenced by raku — we stress bright glaze colours and thin sections in the ware, and our firing is fast, about 1.3 hours to cone 10. Our other interests are technical — alternative fuels for kilns (sawdust injection, alcohols), compression glazes on thin sections, and automatic wood firing. We suspect that fuel shortages and rising costs will force New Zealand potters to explore fuel and firing technology far more than in the past, and many potters will find the adjustment not to their liking, if only because it will dilute their ongoing interest in developing new forms and glazes.

Left: covered caddies, 15 cm. Brushed and stamped iron and rutile glaze. Right: brass handled teapot and tea bowl. 14 cm. Dark blue glaze with stamped green decoration 1300℃ in 1.5 hours.



Firing in the 1980's

Bill Malcolm

The difference between fired and unfired pots is simply the heat work done against the pots' bodies and glazes, but that heat work is substantial — an average car will drive you ten kilometres on the energy required to kiln-fire a one-kilo stoneware pot. Clearly, potters use a lot of energy. But, the good news of the 1980's is that even with fuel prices rising faster than inflation, fuel still represents only 5% of a pot's retail price. The bad news of the 1980's is that the good news means nothing if you can't even **get** fuel. Going on the general principle that good news can look after itself, this article discusses the bad news. How can we cope with the likelihood that at least some of our firing fuels will be scarce in the 1980's? Well, we've got three options — to switch to a plentiful fuel, to fire efficiently with a scarce fuel, or to wait for an alternative fuel.

Option 1 — switch to a plentiful fuel. Most hand-made pottery in New Zealand is fired with diesel. Electricity and wood are the fuels of second-choice, and coal is a distant third. Bad luck, diesel is the problem — of all fuels, it's likely to be hardest to get in the 1980's, if only because New Zealand desparately needs foreign exchange, earns most of it by selling her agricultural products overseas, and runs her agriculture on diesel. But, New Zealand has plenty of electricity (in current glut, so to speak), and at least the hydro-generated portion is unaffected by Mideast unrest or dwindling world oil reserves. Wood, although scarce in some regions now, will be abundant in a few years. Coal is already cheap and abundant in regions where it's mined, and the government plans to step up mining and coal transport. Southland's lignite reserves alone have the caloric value of five Maui gas fields, itself among the world's half-dozen largest.

Admittedly, the switch to wood usually requires building a new firebox, and often an entirely new kiln. Also, wood-firing is dirty and demands close attention, but at least it's basically like diesel-firing, and the ware has high appeal. In short, the cost of going to wood is a new kiln, less leisure, and more bathing. For pay-off, you wipe your fuel worries, don't have to learn much, and get highly marketable pots. Coal is much the same as wood, but your ware won't be sought-after if your glazes suffer sulphur damage.

The switch to electricity requires a new kiln too, but for pay-off you reap more leisure and less bathing. Also, insulation in an electric kiln is far more effective than in a fuel-burning kiln. Trouble is, you'll be lucky to get reduced glazes, and New Zealand's love affair with reduction is certain to outlast the 80's. That single drawback of electric firing puts off most stoneware potters. You could add reducing agents directly to the glaze (finely ground silicon carbide will do). Or you could chuck burnables into the kiln at maturation temperature. Kiln manufacturers, though, warn that element life can be drastically shortened that way, down to ½, and elements aren't cheap. Silicon carbide elements will stand reduction atmospheres, but they're expensive, brittle, hard to get, and require elaborate and expensive wiring circuits. For all that, the Reduction Production Refractory Factory (!) of Massachusetts sells an electric reduction kiln with a 1.5 year warranty (see CERAMICS MONTHLY, February 1980, page 15). And what if Mr Muldoon won't give you an import license? Well, going on the marketing maxim 'If it stinks, feature it', you could turn to glazes that look the same in oxidation as in reduction — cobalt's one of them, chromium another, and there's a seemingly bottomless market for blues in New Zealand, especially bright blues. Potters who specialise in such colours could do well. In the States, a fad is now blossoming in bright, often low-fired, oxidation glazes. American ceramics are prone to such fads, but this one could persist longer than most if fuel shortages carry on as they threaten to.

Lastly, what about solar or laser kilns? They're not exactly your backyard Kiwi thing. Both kinds are very expensive, and anyway are more suited to ceramic research because of their small capacity and ultra-high temperatures. The laser kiln is high technology to boot, and the solar kiln for all the cheapness of its free sun energy is utterly dependant on clear skies. In sum, you're not likely to be the first on your block to own a solar or laser kiln. However, unlike electric kilns, they'll handle reduction easily, so keep your eyes open for a good used one by the turn of the century.

Option 2 — fire efficiently with a scarce fuel. There are ways to get the most out of any fuel-burning kiln — you can fire low, fire fast, fire once, insulate, and use the stack-heat.

First, low-fire. You're led to believe that earthenware is second-class cheapie pottery in New Zealand, but in fact few purchasers can really tell the difference. 'It chips easily', you hear, but well-vitrified earthenware doesn't, and anyway stoneware is often more brittle by dint of being harder. Unless it has a compression glaze (it rarely has) and is well vitrified, stoneware can be surprisingly fragile. Besides, lots of successful potters fire nothing but earthenware.

Second, fast-fire. Most ceramic bodies can withstand rapid heating with no ill effects. Water is the villian, and sometimes the stresses of quartz inversions. Both problems can be solved. Commercial tiles in America are made in 1 hour 20 minutes, and that's from ingredients in the bag to tiles in the shipping package. Nancy and I routinely fire stoneware bodies to cone 11 in 1.5 hours, and we fire raku bodies in 3 minutes. Our stoneware is strong and vitrified. The raku is not, but if we cool it more slowly than the 5 minutes we usually give it, its strength equals earthenware's. At any rate, fast-firing can save you a fifth or quarter of your fuel bill.

Third, single-fire. Not too many years ago, nobody bisqued pottery. Surely all primitive pottery was single-fired, but those magnificent Chinese porcelains were too, and salt-glazed ware still is. Potters bisque mainly for convenience in glazing. It's an indefensible waste of fuel unless it's done during a glost firing. The fact that many potters bisque separately and glost fire with the same kiln-setting is evidence that neither the cost nor the scarcity of fuel worries them yet.

Fourth, insulate. Carborundum Corporation, Kamo-Green, and several other firms manufacture a wide range of ceramic fibre materials. Many are designed for heavy industry or commercial ceramics, but some can be used by potters off-the-shelf with no modifications. The stuff isn't cheap, but with fuel prices rising steadily, you get back the cost before long. With good insulation, you can save a quarter of your fuel costs in a diesel kiln, far more in an electric kiln. It's best to insulate the interior of a diesel kiln, but only the exterior of a wood or coal kiln because ash can flux the ceramic fibre to the point of ruin. And the cost? — figure at least $5 a square foot for typical blanket insulation, but you can get down to $3 for a cheap job, up to $10 for excellent.

And we all have an obligation to conserve fuel whether or not we want to save money.

Fifth, use the stack-heat. Bisqueing is one use, but don't stop there. You can extract most of your fuel's heat with some imagination. Line up a string of jobs from a few hundred degrees Celsius below glost chamber temperatures to a mere 50 degrees above ambient. Heat your bath water — you'll **need** a bath after a wood or coal firing. Dry your greenware and glazed ware or plaster batts, or even the laundry. Heat a glasshouse. You might object that these other jobs don't always need doing when you're firing, but heat is easily stored with high efficiency. Rocks in an insulated bin under the kiln shed or house hold their heat for a week, hot water in an insulated tank for four days. A kiln stack could do the same job as a solar collector does in heating a house, at a much lower capital cost. One-third of New Zealand's electricity goes to heat water, and fully half of your domestic supply does. You could lower your monthly bill substantially with waste stack-heat.

Option 3 — wait for an alternative fuel. New liquid and gas fuels are increasingly touted as replacements for diesel and petrol, but you can forget about saving money with them. The government is deliberately keeping their price high to encourage conservation, and until oil rocketed, they cost more anyway. None of these fuels is really new, but some will soon be used in enormous quantities, which makes them **seem** new. They include lpg (liquified petroleum gas), natural gas or methane (when compressed, it goes by the acronym cng), gas or oil from coal and wood, the alcohols ethanol and methanol, and hydrogen. Of that diverse lot, lpg will be easiest to get in the next 5 years, in steel bottles. In the North Island, natural gas will be reticulated widely, especially between New Plymouth and Auckland. Of the alcohols, methanol or wood alcohol should be easy to get in 3 to 7 years, but before that only as a petrol blend unsuitable for kilns. Ethanol will be easy to get only if it's got colourants and violent emetics added to discourage swilling. But surprise, the government has announced recently it will soon licence farmers to make ethanol from fodder beet, under strict controls and a stiff bond to screen out the riff-raff.

We're all familiar with the commonest of the fuels I've listed, so I'll discuss in detail only the four that you likely have only heard of, at least as fuels — the alcohols, gas or oil from wood, gas or oil from coal, and hydrogen. All four would be especially suited to New Zealand, although that's not to say that the government will use them. For example, the alcohols can readily be made from wood, fodder beet, or Maui and Kapuni gas, resources that New Zealand has in abundance. Hydrogen can be made from water using cheap electricity — New Zealand has both. And New Zealand's coal reserves, although not spectacular, are considerable for a nation of its size and population. Indeed, heavily industrial nations like Japan are more than a little interested in buying large quantities of coal from us, and are already dickering on the price.

The alcohols first. There are lots of alcohols, but as liquid fuels only two are important — methanol or wood alcohol or meths, and ethanol the stuff of drink. Both are systemic poisons, never occurring naturally inside living things except as a waste to be excreted. However, methanol is more quickly and visibly poisonous than ethanol is. Both can be made chemically, but ethanol can be made more cheaply by yeasts.

Lately, much research has gone into making both these alcohols on a grand scale for liquid transport fuels. The government is even into the contract-letting stage on some schemes — Petrocorp got the nod on constructing a methanol plant using natural gas as a feedstock. The methanol can be turned into petrol (Mobil already has that contract) or used as a petrol additive or burned neat, but carburetors must be modified if it's used straight. Ethanol will be brewing in the South Island in a few years if the farmers' lobby gets its way. Canterbury croppers have long been plumping for a domestic sugar beet industry, supposedly to cut back on imports but doubtless also to line the pockets of the growers, who would then enjoy a supply monopoly. However, the sugar that the wee beasties ferment, spewing out ethanol as a waste product, can come from sources other than sugar of fodder beet. The most readily available source is wood. Trouble is, wood gives up its sugars grudgingly — which means higher cost and more trouble. Although it sounds odd, wood actually **is** mostly sugar molecules, but they're stuck together with strong glue in the form of chemical bonds. You can break those bonds with common water, a process called hydrolysis, and release the sugars for fermenting by yeasts, but there's a catch — you must add acid to speed this hydrolysis reaction, and the acid is dear and corrosive. It also must be neutralised eventually or recovered, an expensive and bothersome chore but vital to prevent pollution. Nonetheless, the technology is well known, and experts are recommending to the government that one of five competing techniques for hydrolysing wood be adopted in New Zealand in a big way. It uses weak sulphuric acid and low pressure, but yeilds well, and is attractively cheap.

The process goes like this — wood chips are packed into a hydrolyser, heated to 150°C with steam and impregnated with dilute sulphuric acid for some 20 minutes. Then fresh acid goes in, and the temperature is increased to 185°C. The wood breaks down, and a sugar solution comes out as fast as the acid goes in. After 3 hours when the sugar concentration in the exit liquor drops to about 1%, the hydrolysis is stopped, the solution flash-cooled, and neutralised with mild of lime. The resulting gypsum is filtered (and eventually sold) and the solution concentrated in an evaporator. The final liquor contains 12-15% sugar. Once the sugars are released from the wood they're fermented in the usual centuries-old way known to you firsthand if you've ever made your own beer or wine. However, new distillation techniques make modern alcohol production a lot more efficient than anything you could hope to pull off in the basement. In particular, continuous distillation columns now lower the energy needed, and reduce costs overall. Distillation is one of the major costs of making any alcohols, because of the low concentrations of alcohol produced in fermentation. After all, alcohol is poisonous not only to you but also the the yeasts that make it. Living in a closed solution, they can't flush their alcohol waste away as we do our body wastes, and by the time it builds up to about 13%, they're all well dead. Anyway, given the reality of distillation's high cost, it's understandable that modern research aims to lower that cost, and progress is being made.

Next, gas and oil from wood. Everybody knows that New Zealand has plenty of wood, mostly **Pinus radiata**, the Monterey pine which grows far better here than it does back in its home of California. Being renewable, abundant, and cheap, it's a natural candidate for a fuel source. But being solid, it's not a convenient fuel for vehicles. Hence, there's much interest in turning it into a gas or liquid, and as cheaply as possible. We've already described how to turn wood into alcohol — water and acid break down the wood into its building blocks of sugar residues, which are then fermented. However, there's another way — gasification. The wood is decomposed by severe heating into two gases, carbon monoxide and hydrogen. From them, all sorts of chemical goodies can be assembled, but as well you get several liquid and gas transport fuels like compressed hydrogen and methane, methanol, petrol, and diesel. That's good news for potters who fear unfamiliar fuels may altogether disappear. Also, all the technology is off-the-shelf and well-known.

Like any other polymer, wood decomposes at high temperature. If heated with oxygen in a closed vessel, it breaks down to about equal percentages of charcoal, gases, water vapour, and hydrocarbons plus tars. Altogether some 200 different compounds are made. After decomposition, some of the products react with the oxygen inside the heating vessel. Heat comes off, and the temperature in the vessel reaches its maximum, high enough to crack the hydrocarbons and tars to simple gases. Finally, any remaining char is gasified by carbon dioxide and water. The reaction has to be controlled carefully, but if done well, the end products are carbon monoxide, hydrogen, methane, carbon dioxide, and water. To turn those gases into a liquid fuel, the carbon monoxide is hydrogenated, made richer in hydrogen. It's a process of world-wide importance — most of the world's methanol and ammonia are synthesized from carbon monoxide and hydrogen, and just by changing the catalyst and reaction conditions, you can make a wide range of end-products. For example, with a nickel catalyst and ordinary pressure, methane comes out. With a zinc-copper catalyst and high pressures, it's methanol. And, at the same high pressure but with an iron catalyst, an oily liquid rich in alcohols turns up, and lowering the pressure somewhat you get hydrocarbons instead.

Just as wood can be made into gas or oil, so can coal. Wood enjoys some advantages over coal in being easier to get at, renewable, and lacking sulphur contamination. Potters can suffer glaze defects from sulphur contamination in ordinary diesel, and so they'd be keen to see synthetic diesel well-scrubbed. That's going to mean higher cost, of course, so in that sense potters have an interest in pushing for New Zealand's making synthetics based on wood rather than coal. Nonetheless, potters never have been known for their lobbying clout (despite last year's roll-back of the sales tax), and it's best to prepare for fuels from both feedstocks. So, coal gasification first — it's usually the first step in making liquid fuels from coal anyway.

In spite of the historical reality that coal fueled the industrial revolution, coal never has been a convenient fuel. It's solid for one thing, dirty for another, both to handle and to burn. Therefore if we're to exploit our coal reserves, we must find some large-scale way to convert the coal to liquid and gas. Coal-gas plants were a commercial reality early in the 1800's, and at least small coal-oil plants already are working. But, the economics of big plants still are uncertain. True enough, some fairly big plants have been built when cost wasn't important — wartime Germany and present-day South Africa come to mind most quickly. Germany's war effort would have crumbled for lack of fuels without synthetic petrol — 12,000 barrels a day was the peak, and the Sasol plant in South Africa is making about 6 times that and has been for 20 years. Plans are underway in America for much bigger plants, about 8 times the Sasol plant, but neither the German nor the South African process can be expanded that far and still be economic, so a new approach is needed.

The conversion of coal into gas and oil demands only adding hydrogen to the coal. The ratio of hydrogen atoms to carbon atoms in coal is less than 1 to 1, in oil almost 2 to 1. The hydrogen for the conversion comes from water in the form of steam, and the energy must come from the coal itself to keep costs down. As might be expected, the production of hydrogen is a large chunk of the total cost of the conversion.

For the chemists among you, the gasification of coal produces so-called synthesis gas, a mixture of carbon monoxide and hydrogen. The carbon monoxide is further reacted with more steam to get more hydrogen. $CO + HOH \rightarrow CO_2 + H_2$. The gasification inevitably produces some methane (CH_4) along with the carbon monoxide and hydrogen, and it's usually collected separately because it's easily marketed as natural gas. The rest of the hydrogen is reacted in various ways to make more complex hydrocarbon gases like propane, butane, and so on.

The synthesis gas does burn by itself, of course, but no city council would dare deliver it to homes because the carbon monoxide is poisonous, and the hydrogen is leak-prone and requires special burners. The gas also has far less energy per cubic foot (about 300 Btu) than natural gas (over 1000 Btu). For these reasons, the carbon monoxide/hydrogen mix is methanated, that is, converted to methane by passing it over a nickel catalyst. Unfortunately, the methanation can not yet be done on a commercial scale. As a result, some plants gasify only part of the coal to form hydrogen, and then react it with more coal. $C + H_2 \rightarrow CH_2$. That cuts out the tricky catalyst part, and the reaction doesn't require heating.

If you want oil from coal, rather than gas, you can get it in 4 different ways, not all of them attractive from a cost view. The oldest is carbonisation, just heating coal in the absence of air. You get tar and gas and coke, and indeed that's how coke has been made for centuries. The technology therefore is well-known, but coke ovens are expensive, and so carbonisation is economic for making only coke, not oil. Coke is valuable enough in its own right for steel-making, but oil probably never will be made from coal that way. A better way is what the Germans used during the war — it's called hydrogenation, and reacts the coal at high pressure with hydrogen, using a cobalt molybdenum catalyst to speed things up. The coal is fed in as a slurry and the hydrogen as a gas. The mixture is agitated and put under extreme pressure, up to 4000 psi. Temperature control is critical to get the right end-products and to prevent plugging the reactor vessel with carbon.

A third way to make coal into oil is extraction with solvents. You can go about it by dissolving the coal in an organic solvent with hydrogen at a pressure of 2500 psi. New techniques use much lower pressure, 300 psi, and the technology doubtless will continue to improve.

The fourth oil-from-coal process is the Fisher-Tropsch, in the news lately in New Zealand for making synthetic fuels. It's named after two Germans who developed the process. The coal is burned in oxygen and steam, making mostly carbon monoxide and hydrogen. The gas is purified and then passed over a catalyst, making everything from methanol to waxes, oils, and other heavy hydrocarbons. It's the method used in the Sasol plant in South Africa.

These four ways of making oil from coal could well be combined. The plant would then be more accurately thought of as a coal refinery, similar to an oil refinery, which makes a wide variety of products from a single feedstock.

Hydrogen is the least likely fuel for potters in the 80's, but in some respects it's the best option, so I include it. Some experts rank it tops for a final solution to the problem of an everyday fuel, for home heating and cooking, industry, and transport, and even for making electricity. Because it could be used for everything, the concept is called the hydrogen economy. You don't hear much about the hydrogen economy in New Zealand, possibly because it would be efficient only in heavily developed nations like America where 80% of homes have natural gas laid on in pipes, and where the handling of hydrogen already is common in industry and rocketry for space flight. However, New Zealand is fast becoming urbanised at least locally, and it would be easy to switch to hydrogen in cities like Auckland and Christchurch. Wellington is more of a risk as an earthquake-prone area.

So what does hydrogen have going for it that the other fuels I've discussed don't have? First off, when it burns it makes only water, not water and carbon dioxide. And, if you believe all the scare-talk about the glasshouse effect, melting of polar ice, and worldwide flooding of coastal areas, it could make sense to start the switch tomorrow morning, early. Anyway, besides halting pollution by carbon dioxide, the hydrogen economy would also halt pollution by carbon monoxide, sulphur dioxide, hydrocarbon particulants like fly ash and soot, and photochemical oxidants (commonly called smog). If nothing else the world would look, smell and be much cleaner. The only pollutants left would be nitrogen oxides produced in the hydrogen flame from nitrogen in the air, but any flame makes them. Another advantage — hydrogen can be made readily from ordinary water, which means it's virtually inexhaustable. And, once burned, it's again water, which makes it a re-cycled fuel, unheard of in a time of dwindling fossil fuels. Notice hydrogen in that sense is far better than trees or other merely renewable fuels — it can be recycled, with no wait between fuel cycles, except for the short time it takes you to split water to make more hydrogen. There's no other fuel like it. Another related advantage — a major part of the cost of any fuel delivery system is the empty return. For example, when you buy lpg from your industrial gases supplier or City Council, it comes in an expensive and heavy container. When you've used the gas, you've got to return the container for refilling, and in the meantime you pay demurrage on it, a rental fee. The beverage industry labours under the same problem, and the empty return is getting so uneconomic that no deposit/no return has taken over in developed nations like America and threatens to here as well, with ring-pull cans and paper milk cartons. Of course, there's no way a gas under pressure like lpg will be delivered in a throwaway, so the problem will have to be solved more imaginatively. Well, with hydrogen, there's no return empty problem at all. The world-wide water cycle does the job of returning burnt hydrogen for re-cycling and also delivering supplies of water for making into more hydrogen fuel, and utterly free, no maintenance system that would be the envy of any gas supplier.

Yet another advantage — the easiest way to split water to make hydrogen is with electricity. And, electricity generation has always suffered from mismatched supply and demand. What's needed is some way to store electrical energy — and what better way than to generate electricity at a constant rate, using all the excess to make hydrogen, which then can be stored and used as a fuel itself, or used to fire extra generators in periods of peak demand. Fossil fuels like oil, fire the extra generators nowadays, but that's not on for many more years.

There's an extra advantage for potters if New Zealand went to a hydrogen economy. Potters, more than most folk, like to live and work in rural areas. If they have a source of electricity, even a windmill, they can make hydrogen. Even desert areas have enough water in the atmosphere for a plentiful supply. They would have a storage problem, of course, because a kiln uses a lot of fuel in each firing, and if a potter goes to the trouble of making hydrogen for firing, he might as well use it for cooking brekkie too, adding to his storage problem. But, new storage techniques are being developed — metal hydrides work, and now organic and inorganic hydrides are being tried out. Cryogenic storage is used for big depots like the Kennedy space centre, although clearly that's not for potters.

But what about the Hindenburg syndrome, you ask? Hydrogen has the reputation of being alarmingly flammable and explosive. The reputation is deserved, at any rate. Hydrogen isn't detectable by any of our senses, so a leak is potentially very dangerous. However, the same is true of natural gas, and that's why odourants are added to gas. The flame of hydrogen is invisible, too, so an illuminant must be added to it. But again gas is the same, so the problem isn't insoluble. Hydrogen is no more flammable than methane at low concentrations in air (4% for hydrogen versus 5% for methane), but the flammability goes up to 75% in air. At least a hydrogen leak is less likely to accumulate — hydrogen is so light a gas that it diffuses away quickly and is therefore less hazardous than a gas leak. However, hydrogen takes much less energy to ignite than gas does, and that's probably why the Hindenburg came to grief — it takes 10 times as much energy to ignite a petrol-air or methane-air mixture as a hydrogen-air mixture, and even a spark of static electricity will do the job. In spite of that, huge quantities of hydrogen are handled routinely without accident, but there's no doubt that safety standards must stay high. In sum, hydrogen could be an urban fuel in the future, and an excellent fuel for potters living in cities, with no pollution and low cost.

Because fossil fuels are dwindling and rapidly rising in price, firing during the first half of the 1980's will be at best uneasy for potters, and at worst very difficult, but a great variety of alternative fuels should come on-stream in the second half of the decade. Potters are sure to find good firing fuels among them, some better than what they're burning now. Supply problems could largely disappear, water and air pollution lessen dramatically, and prices stabilise, although they'll surely remain higher than current prices. In the meantime, the quickest fix for your fuel worries is switching to wood or electricity, and happily enough, even if you can't be bothered, you probably won't be inconvenienced for long — by 1990 you could be firing with a synthetic diesel that burns cleanly, sports a kiwi label, and never runs out.

Kiln for Fast Firing by Bill Malcolm, Potter Vol. 20/2

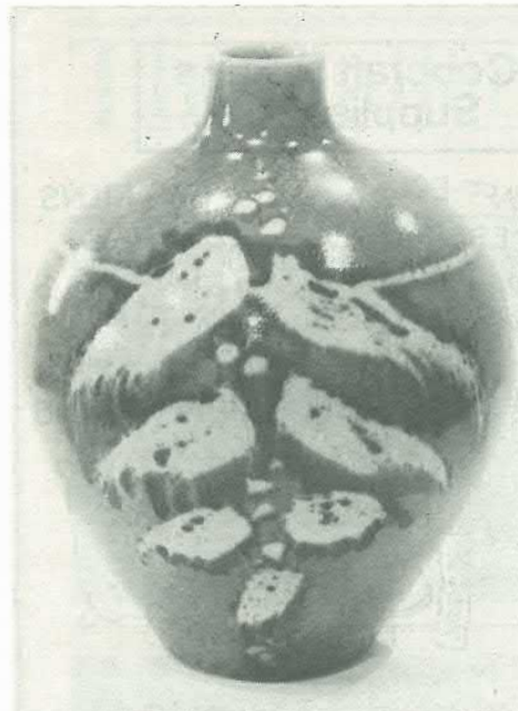
Visitors from America

Gerry Williams, founder of the Phoenix Pottery Workshop, New Hampshire USA, and editor of the magazine **Studio Potter** visited Australia and New Zealand in January of this year. The New Zealand Potter was delighted to renew acquaintance with Gerry and Julie and arrange for them to meet potters in Nelson, Dunedin and Auckland.

They were the first official visitors to the newly formed Nelson Potters Association. There Gerry conducted a workshop and gave a lecture. Peter Gibbs reports.

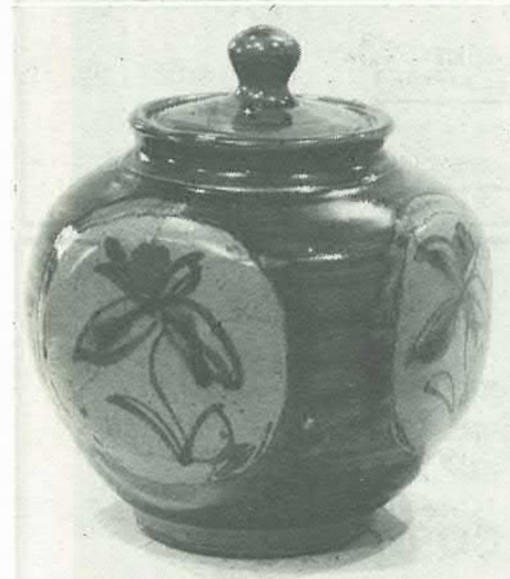
Although his interests in working with clay are fairly broad, Gerry discussed in particular two techniques unfamiliar to most potters. Wet firing is a pretty exciting direct process, involving taking the pot straight from the making process into the kiln. The secret behind this technique is to wedge equal parts of clay and ceramic fibre together, along with up to 20% sand. Pieces are made with a heavy foot or some other provision for grabbing them with tongs to put in the kiln. The second process was that of photo resist — getting images onto pots using light sensitive emulsions.

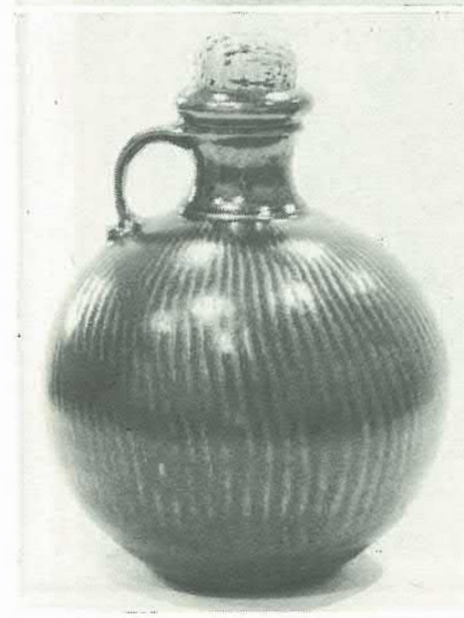
An evening session involved a showing of the film 'An American Potter" preceded by a selection of slides of contemporary American potters and their work. Gerry provided a commentary on the slides which gave a good insight into what's going on in America today. The film that followed was excellent. The "American Potter" of the title was, of course, Gerry Williams. This film has won many awards and has been shown on national educational television.

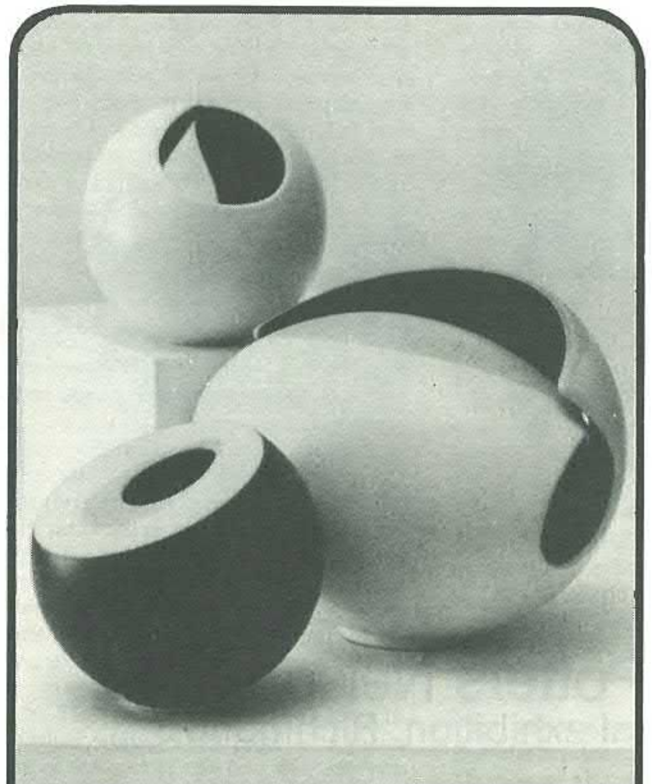


Craft Potters Nelson
6th annual exhibition, Richmond

Left above: Carl Vendelbosh, blue glaze wax resist.
middle: Jane Gregory.
below: Ross Richards.
Above right: Robert Wallace.
Right: Joan Beck, carved shino glaze.
Below: Trevor Briggs, earthenware blue on white.
Photos: Ray Pengelly







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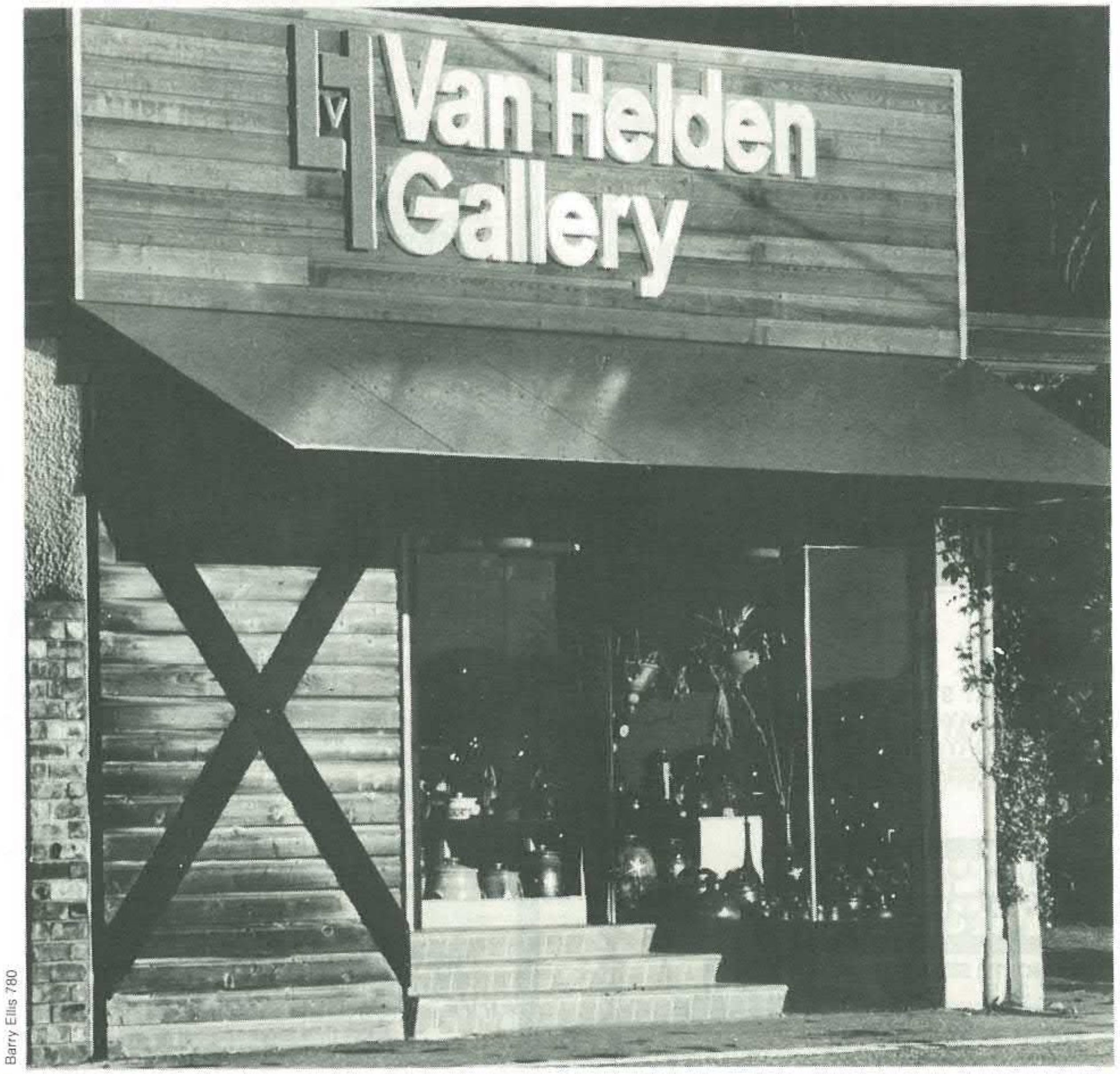

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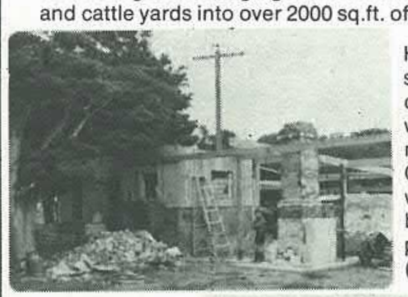
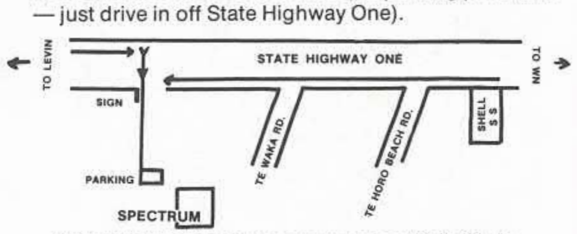


Here Campbell stands by the chimney of the wood fired kiln, masterminded by Glen Beattie, while the buildings progress well (October '79).

Looking from the other side — a pergola over the garden area takes shape (February '80) and the indoor display/kiln area is roofed over. The "mess" in these pictures is now all gone — (March '80).

Here's how to find us at **Te Horo** (no parking problems — just drive in off State Highway One).



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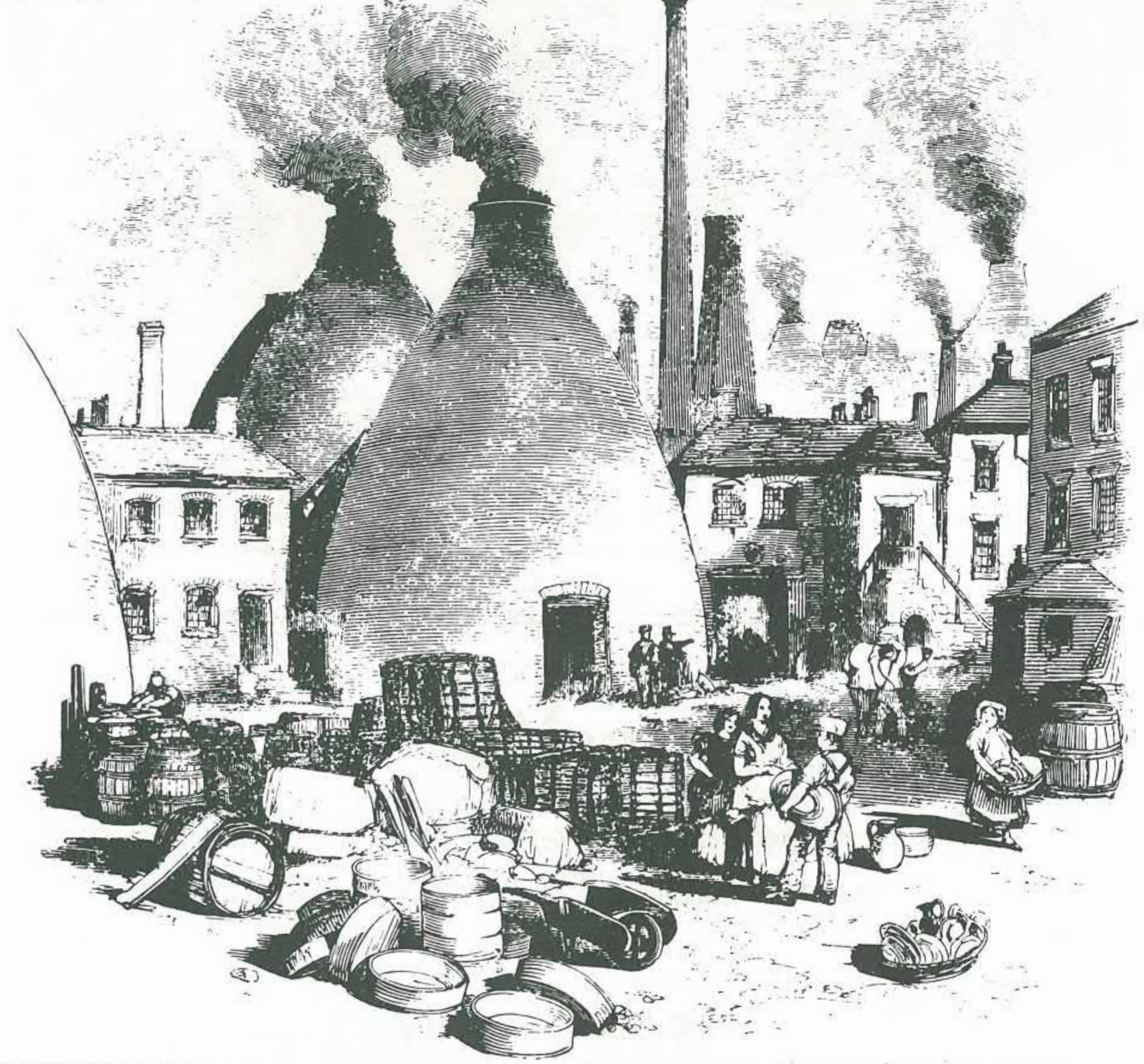

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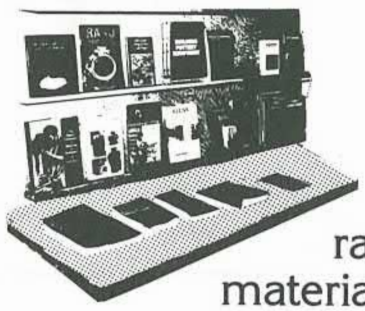

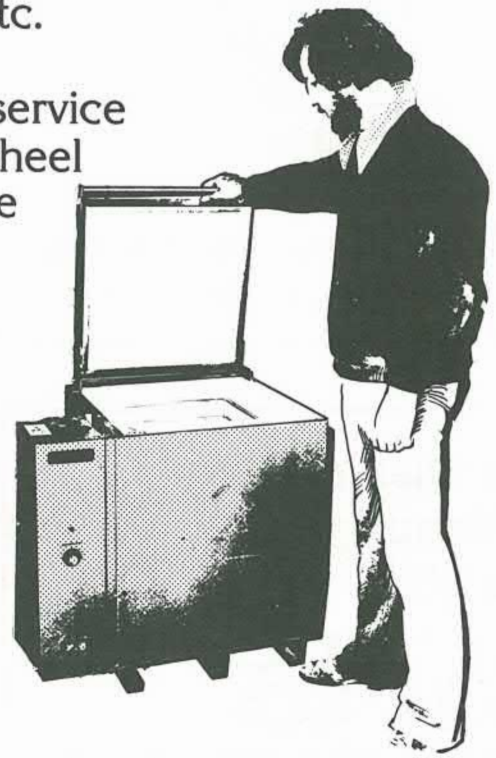

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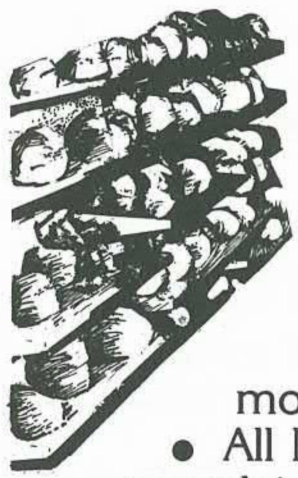

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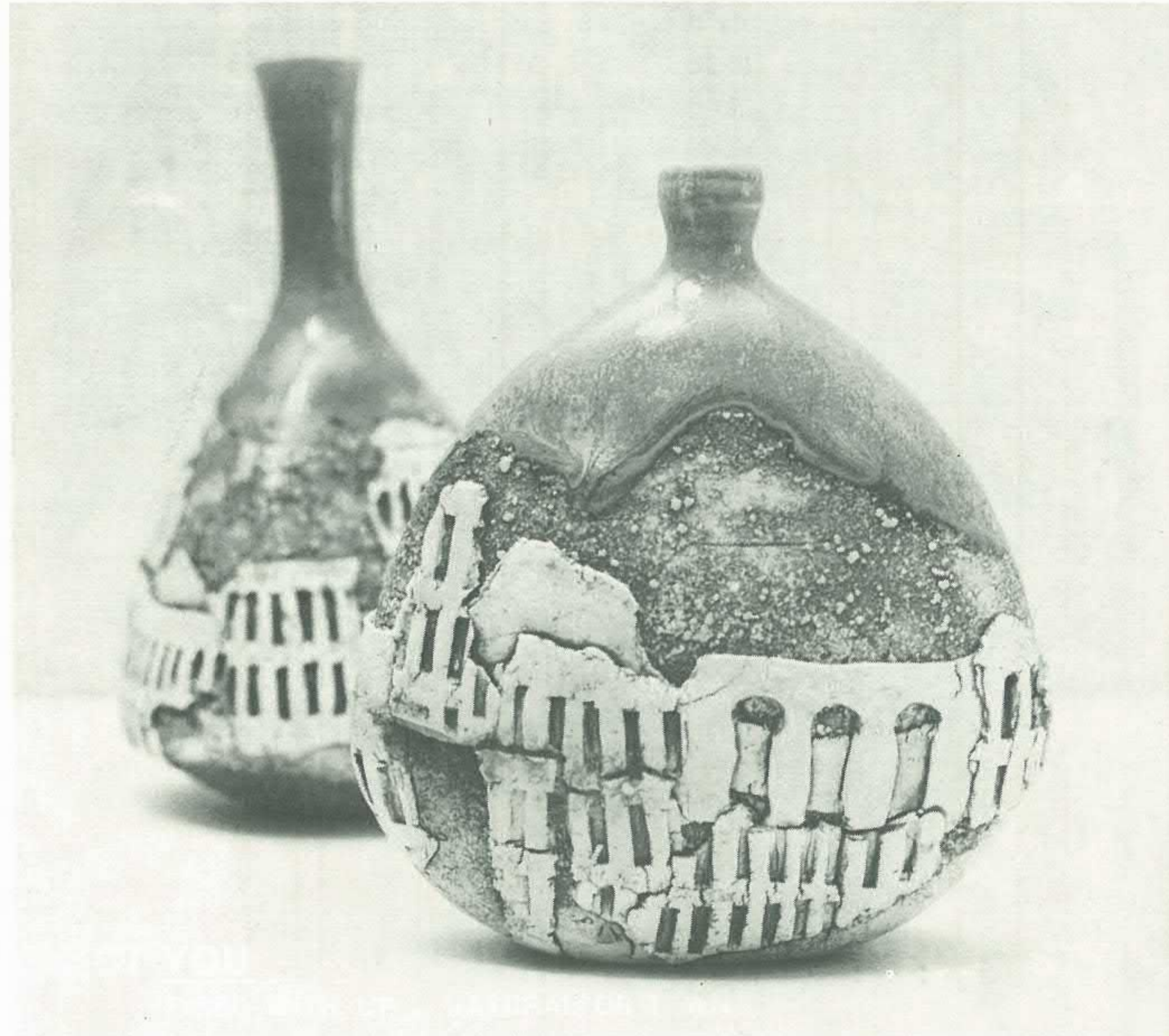

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