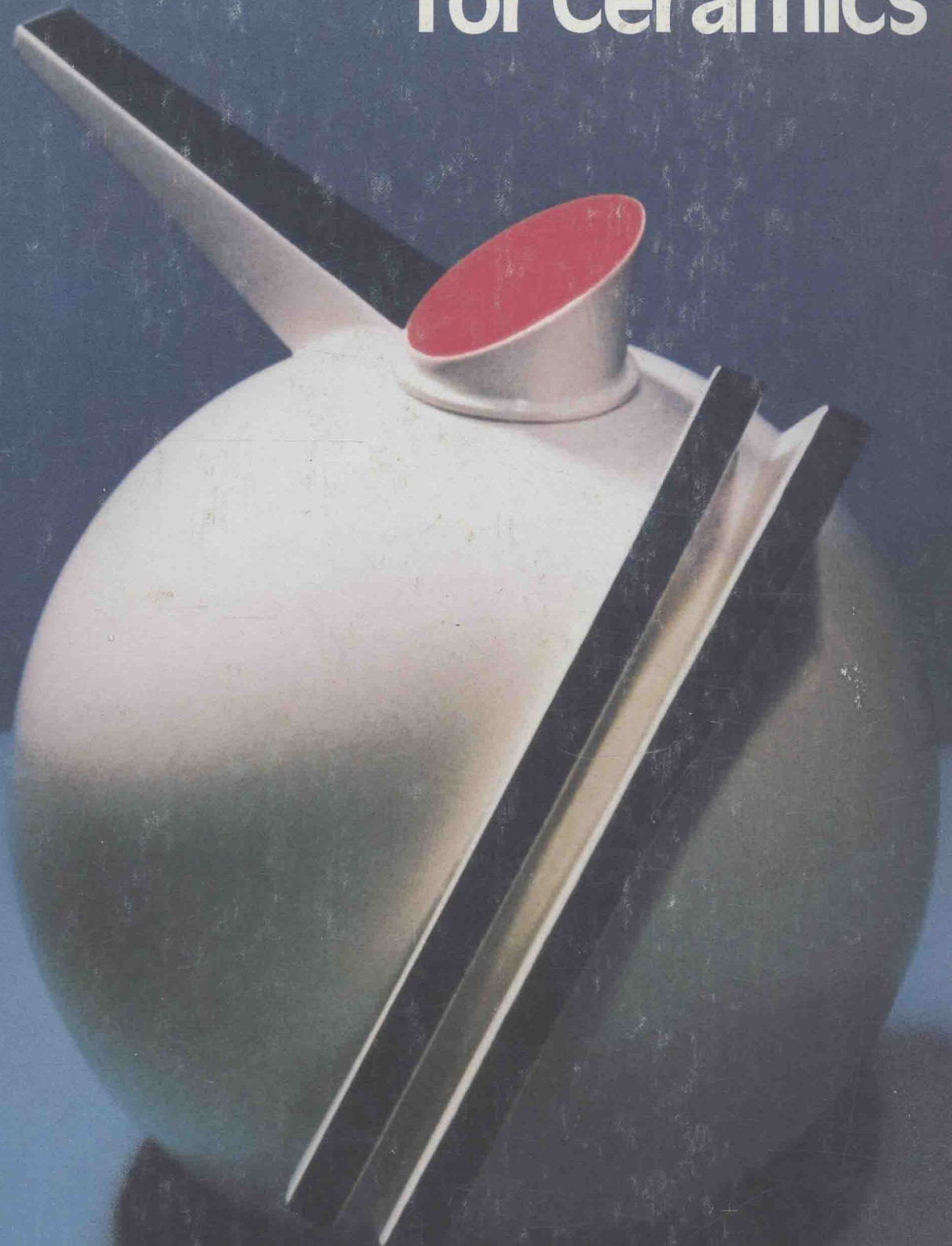


Mold Making for Ceramics



Donald E. Frith

Donald E. Frith

Mold Making for Ceramics

江苏工业学院图书馆
藏书章

Chilton Book Company Radnor, Pennsylvania
A & C Black London

Copyright © 1985 by Donald E. Frith
All Rights Reserved
Published in Radnor, Pennsylvania, by Chilton Book Company

First published in Great Britain 1992
A & C Black (Publishers) Limited
35 Bedford Row, London WC1R 4JH
ISBN 0-7136-3648-3
A CIP catalogue record for this book is available from the British Library

No part of this book may be reproduced, transmitted or
stored in any form or by any means, electronic or mechanical,
without prior written permission from the publisher

Designed by Jean Callan King/Metier Industrial, Inc.
On the cover: Marek Cecula, New York, N.Y.
"Bauhaus Memory IV," porcelain, 14"
Manufactured in the United States of America

Library of Congress Cataloging in Publication Data
Frith, Donald E.

Mold making for ceramics

Includes bibliographical references and index

1. Ceramics—Equipment and supplies. 2. Molding
(chemical technology) I. Title.

TP809.5.F75 1985 666'.442 84-21470

ISBN 0-8019-7359-7

3 4 5 6 7 8 9 10 11 1 0 9 8 7 6 5 4 3 2

Mold Making for Ceramics



To John Billmyer, Arthur Pulos, and Charles M. Harder,
each of whom played an important part in my life

*True spontaneity is the result of freedom
and freedom is possible only through knowledge.*

Tao

The goal of this book is to demonstrate the art of producing pottery forms from molds. At base, it is a "how-to-do-it" book, intended to enable eager and searching ceramists to successfully use molds in the fulfillment of their most inventive ideas or in the creation of beautifully designed products for the market. Beyond that, it is my hope that this book conveys the high level of craftsmanship and artistry involved in mold making. Beauty lies not only in the finished work, but also in the molds themselves and the techniques of their creation. I have made no attempt to express a philosophical viewpoint, assuming one could have one, other than that mold making is indeed an art, and that there is great pleasure and reward to be gained from making molds that exhibit beautiful craftsmanship and that serve to produce high-quality products.

The book consists of three parts, covering the following topics: (1) beginnings (historical review, tools and equipment, and working with plaster), (2) making and using press molds for plastic clay, and (3) making and using molds for slip casting liquid clay. In addition, it contains a review of the work of over 20 contemporary artists, showing in full color a wide variety of mold-made ceramics. In the preparation of the "how-to-do-it" chapters, over 500 photographs were taken. Each step, each process, was carefully photographed to assure that every detail would be pictured and explained. It was standard to shoot 50 photographs in order to get 15 that illustrated in a sequential manner exactly what is going on.

It takes much more than photographs and words to produce a book like this, and no one can undertake such a project without help. First to be thanked is my wife, Barbara Toepfer Frith, for the typing, correcting, and retyping of the manuscript.

For the most part, all the museums contacted gladly furnished photographs of pieces I was interested in for the book. In particular, I would like to thank Ross Taggart, curator of the Nelson-Atkins Gallery, Kansas City, Missouri, Ken Ferguson, and photographer Gary Sutton, who provided the beautiful close-ups of the 18th-century English press-molded dishes; Christopher Donnan, anthropologist at the University of California at Los Angeles, who

Preface

made possible the Chimu mold photographs; and Lawrence Dawson, anthropologist at the University of California, Berkeley, who furnished the panpipe mold photographs. I also want to acknowledge Lynn Turner of Berkeley, California, and Richard Notkin of Myrtle Point, Oregon, who not only sent me some

very fine photographs of their work, but also sent me some sound information about mold making. Mary Rush Shaw, Alexandria, Virginia, supplied me with information on various rubber products and suppliers.

PART I BEGINNINGS 1

CHAPTER 1 HISTORICAL REVIEW 3

Historical Examples of the Use of Molds 4

The Ancient Mediterranean 4

Chinese Molds 6

Roman Pottery 9

Middle and South America 13

The Development of Plaster Molds 15

The Ancient World 15

Sixteenth-Century Italy 16

The Staffordshire Potteries 18

Plaster vs. Fired Clay Molds 21

Master, Block, and Case Molds 22

Slip Casting 24

Spinning Molds, Jiggers, and Jollies 25

Automatic Presses 28

CHAPTER 2 TOOLS AND EQUIPMENT 31

The Plaster Shop 31

Tools and Equipment 32

Major Equipment 33

Tools for the Tool Box 33

Other Tools and Accessories 38

Tool Maintenance 42

The Plaster Wheel 43

CHAPTER 3 WORKING WITH PLASTER 47

How Plaster Is Made 47

Physical Characteristics of Plaster Molds 50

Preparing a Batch of Plaster 51

The Plaster Batch Calculator 51

Consistency 52

"Peaking" and Using Premarked Containers 52

Stages of Setting 53

The Mixing Routine 53

Mechanical Mixing Devices 55

PART II PRESS MOLDS 61

CHAPTER 4 STAMPS AND SPRIGG MOLDS 63

Positive and Negative Form 63

Making a Stamp 64

Contents

The Stamping Process 67
Pressing Deep Reliefs 70
Sprigg Molds 70

CHAPTER 5 HUMP MOLDS,
MUSHROOM MOLDS, AND JACKS 74

Hump Molds 74
Mushroom Molds 74
Making a Hollow Hump Mold 76
Hump-Molded Bowl of
Thin Porcelain Sheets 80
Jacks 82

CHAPTER 6 COMBINING PRESSED DECORATION
AND HUMP-MOLDED FORMS 86

"Wet-Carving" the Press Mold 86
The Pressing Procedure 86
Pressing the Hump-Molded Piece 89
Assembling the Form 89

CHAPTER 7 PRESSING A LARGE TEAPOT 91

The One-Pour, Two-Piece Mold 91
The Base Plate 91
Making the Model 92
Setting Up the One-Pour Mold 93
Making the Spout 94
The Handle: Using Natches
in the One-Pour Mold 96
Pressing the Teapot Body 96
Making the Top and Lid 96
Pressing the Spout and Handle 98
Assembling the Teapot 100

CHAPTER 8 STYROFOAM
AND WOODEN MOLDS 103

Styrofoam Press Molds 103
Wooden Press Molds 109

CHAPTER 9 PRESS MOLDS FOR TILE 111

Deep Relief Tiles 112
Flat "Mosaic" Tiles 115
Stamp-Molded Tiles 117

CHAPTER 10 PRESS MOLDING
IN 18TH-CENTURY AMERICA 122

CHAPTER 11 PRESS MOLDING
FOR PRODUCTION 129

Hand Jiggering: The Case
Mold with Base Plate 130
Making the Plaster Wheel
Head and Jigger Chuck 130
Making the Case Mold 135
Varying the Designs Using the Base Plate 137
Renewing the Plaster Wheel Head 137
Positive and Negative Molds 137
Using a Jigger Arm 138
A Studio-Made Jigger Arm 138
The Double-Action Jigger 140
Summary 144

PART III SLIP CASTING 147

CHAPTER 12 SETTING UP
THE PLASTER WHEEL 149

Introduction 149
Casting a New Plaster Head 150
Making the Plaster Blank for the Model 152

CHAPTER 13 MAKING A MODEL
AND MOLD OF A NON-ROUND FORM 154

Turning the Model 154
Modifying and Finishing the Model 155
Making the Spare 157
Finding a Separation Line
for a Non-Round Form 159
The No-Natch Contoured Separation Plane 163

CHAPTER 14 THE PRESENTATION
MODEL: A COFFEE POT 167

Turning the Blank for the Body 168
The Handle, Spout, and Completed Model 170

CHAPTER 15 MOLD MAKING
ON THE PLASTER WHEEL 172

Using the Wheel Head as the Base Plate 172
Making the Waste Mold 173
Setting Up the Mold Boards 175

Cutting Natches and Pouring
the Second Half of the Mold 176
The Top and Bottom Spares 177

CHAPTER 16 MOLDING THE
HANDLE, SPOUT, AND LID 181

The Spout Mold 181
The Handle Mold 184
The Lid Mold 185
Casting and Assembling the Coffee Pot 186

CHAPTER 17 CASE MOLDS
FOR THE COFFEE POT BODY 189

Making the Gypsum-Cement Cases 189
Using the Cases with Wooden Mold Boards 190
Making Rails for the Case 191
Production Quantities 193

CHAPTER 18 CASE MOLDS FOR
THE HANDLE, SPOUT, AND LID 194

The Handle and Spout Cases 194
The Rubber Cases for a Three-Piece Mold 194

The Rails 196

The Third Piece of the Case 196

The Lid Cases 198

The Gypsum-Cement "Ring" Cases 198

The Rubber Parts of the Lid Case 199

CHAPTER 19 SOLVING MOLD
SEPARATION PROBLEMS 202

Causes of Separation Problems 202
Applying Compressed Air 203
Wedging 203
Plaster Expansion 206

CHAPTER 20 CASTING SLIP
AND DEFLOCCULATION 208

Understanding Deflocculation 208
General Guidelines for Mixing Casting Slips 209

SOURCES OF SUPPLIES 215

GLOSSARY 218

INDEX 221

Part I: Beginnings



A Chimu stirrup handled bottle, 1100–1500 A.D., made in a two-piece, fired clay press mold. Private collection; photograph courtesy of the Museum of Cultural History, University of California at Los Angeles.

Man's earliest endeavors to form clay objects often involved the use of molds. A mold is a form or object used to shape a plastic or fluid substance. Broadly speaking, then, the finger was undoubtedly the first press mold. The fingers of the ancient potter not only shaped the vessel or figure from clay, but often these same fingers were used to impart a repeated pattern of prints on the rim or foot of the vessel or figure. The fingerprint pattern thus became a press-molded decoration on the pot.

The paddle and anvil method was one of the first systems developed by potters to shape vessels from clay using implements rather than fingers. This system is still the basis of vessel making in many clay-working societies today. The manner in which the paddle and anvil are used permits both implements to be characterized as press molds. Often the paddle surface is decorated with wrapped cord or with a series of carved grooves or other patterns, and the decorative pattern is transferred to the clay when the paddle strikes it. In this case, the paddle truly acts as a press mold.

There are also many examples of ancient sherds with basket weaving imprinted on the surface of the fired clay.¹ Pressing clay into the inside surface of a woven basket produces a clay vessel bearing the pattern of the weaving on its outside surface. In making this type of pottery, the basket serves as a press mold.

From these few examples, we can see that clay can either be pressed into a "mold" or the "mold" can be pressed into the clay. (The act of pouring liquid clay into a mold is not being considered at this point in this historical review because the casting process did not come into general use until very recent times. However, the Peruvian panpipes are a unique exception to this rule, and they are discussed later in this chapter.)

Pressing or molding is one of the most ancient techniques of pottery making. Bernard Racham, in his excellent introduction to the subject of "Pottery and Porcelain" in the *Encyclopedia Britannica* (1951), states:

From this pure clay, vessels were shaped by scooping out, or cutting a solid lump or ball, by building up piece by piece or by squeezing cakes of clay onto some natural

CHAPTER



Historical Review

object or prepared mould or form. The potter's wheel, though very ancient, was a comparatively late invention, arrived at independently by many races of men.²

The development of methods of forming clay by pressing and squeezing clay with the fingers or using a paddle is completely natural. Anyone who has ever begun to work a ball of plastic clay with their fingers in some spontaneous way will soon press this exceedingly pliable material against something or press something into the mass of clay. The real miracle is that the clay, when hardened, retains the exact features of whatever is pressed into it. An especially important example of this "miracle of clay" is the

Fig. 1.1 Two identical molds of fired clay, indicating that they were taken from one master mold. Unearthed in the Gaza Strip in 1982, they probably date back to 1300 B.C. Photograph by Sisse Brimberg; © 1982 National Geographic Society



cuneiform tablets of ancient Assyria. The Assyrians "printed" records on clay tablets using a stylus with a triangular-shaped end. Their practice of writing on clay slabs and then preserving the slabs by firing them in a kiln has enabled scholars to learn many details of the Assyrian way of life. The stylus is indeed a type of press mold, and the imprinted clay tablets are in excellent condition even after some 3500 years.

HISTORICAL EXAMPLES OF THE USE OF MOLDS

The Ancient Mediterranean

In 1982, Israeli archaeologist Trude Dothan uncovered the two molds pictured in Figure 1.1 in a dig near Deir el-Balah in the Gaza Strip.³ The molds are thought to date from 1300 B.C. The most interesting

Fig. 1.2 A red-figured Greek rython, clearly showing the seam mark of the two-piece mold that was used to make the head. Courtesy of The Metropolitan Museum of Art, New York, Rogers Fund, 1906 (06.1021.203)





Fig. 1.3 Greek rython with ram's head. Courtesy of the Museum of Fine Arts, Boston, Perkins Collection, Purchase of E.P. Warren

feature of these molds is that they are identical, indicating that both molds were taken from one "mother mold." A careful look at the edges of the two molds reveals signs of the once-presence of the other halves of the molds. The two-piece mold would have produced a small figurine bottle with a front and back, a little standing goddess made by pressing clay into each half of the mold and then pressing the halves together. That the molds were evidently made from a "mother mold" or "case mold" indicates, in all probability, that many such figurine bottles were made and that the system of using a piece mold was well known some three thousand years ago.

There is no doubt that early Mediterranean civilizations knew how to use molds. The use of molds

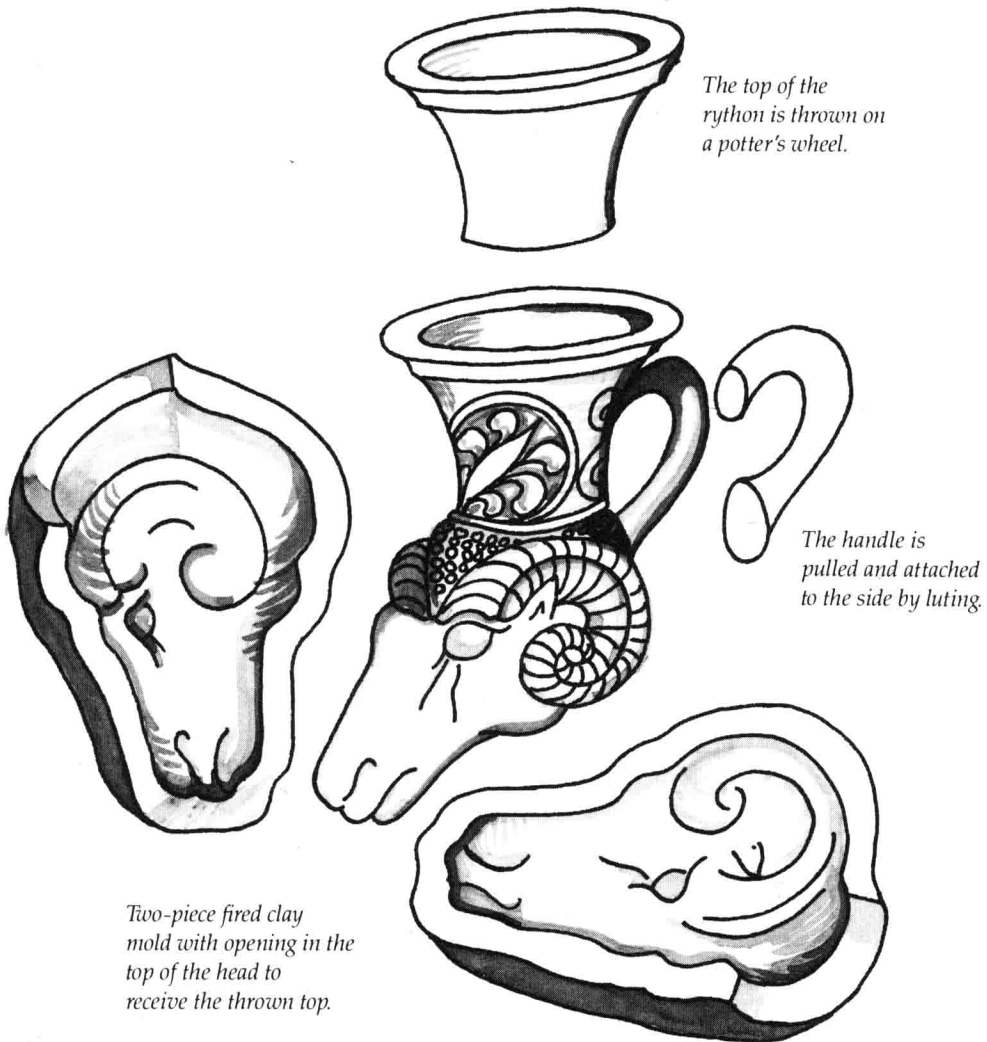


Fig. 1.4 Procedure for making a Greek "plastic ware" rython.

to aid in the production of clay and metal objects was well understood by many civilizations more than three thousand years before the Golden Age of Greece.

The potters of 5th-century-B.C. Greece were excellent mold makers as well as technical masters on the wheel. The Greek method of making molds was undoubtedly identical to the method employed by potters of other cultures. The object to be molded was covered with a layer of plastic clay; if a two-part mold was necessary, the clay that covered the object was cut to permit its removal from the object. The two pieces of the mold were then fired to a temperature high enough to harden the clay and yet permit the clay to retain porosity. Often the outside of the molds had grooves to permit the two pieces to be tied together securely with a rope.

The ancient Greek potters used molds to produce objects that could not be produced by the throwing process. According to Gisela Richter:

The Greek potter did not use moulding as a labor-saving device. He employed it only where the work demanded it, as in Athenian plastic ware [Richter uses the word "plastic" to describe objects that could not normally be formed on a potters wheel, such as a drinking vessel in the shape of a ram's head] . . . That the Athenian plastic vases were pressed into moulds rather than poured can be seen from the fact that the insides of these vases are

*rough and show finger-marks. . . . The joints of the two parts are clearly visible on many examples. . . .*⁴

Greek rythons offer striking examples of such press-molded figures. Figure 1.3 shows a rython with a press-molded ram's head. In Figure 1.2, the seams of the two-piece mold are clearly in evidence. In making rythons such as these, the potter used a two-piece bisque mold to form the figure. Then he assembled the thrown top, pulled handle, and molded figure (see Figure 1.4). Although the exact details of the assembly method are not known, it is possible that the thrown top was attached to the head while the head was still in the mold.

Chinese Molds

From the earliest times Chinese potters used molds to form and decorate clay and metal objects. Indeed, the use of molds in Chinese ceramics and metal work is closely related. For example, there is much evidence of the use of fired clay molds to cast bronze vessels and sculptures.⁵ The question inevitably arises as to which came first, the bronze vessels or the molded clay vessels? It is tempting to think that clay came first. A clay master mold is obviously ideal for use in the production of either clay or metal objects; moreover, the bronze vessels sometimes show a roundness typical of that produced on a wheel. Whichever came first, however, it is clear that the Chinese used molds to meet their reproduction needs, both in clay and in metal.

Fig. 1.5 A die-stamped hollow tile from a Han Dynasty tomb. Courtesy of The Cleveland Museum of Art, Cleveland, Gift of Mr. and Mrs. Ralph King

