

# GLASS-WORKS

THE COPPER FOIL TECHNIQUE  
OF STAINED GLASS

JENNIE FRENCH







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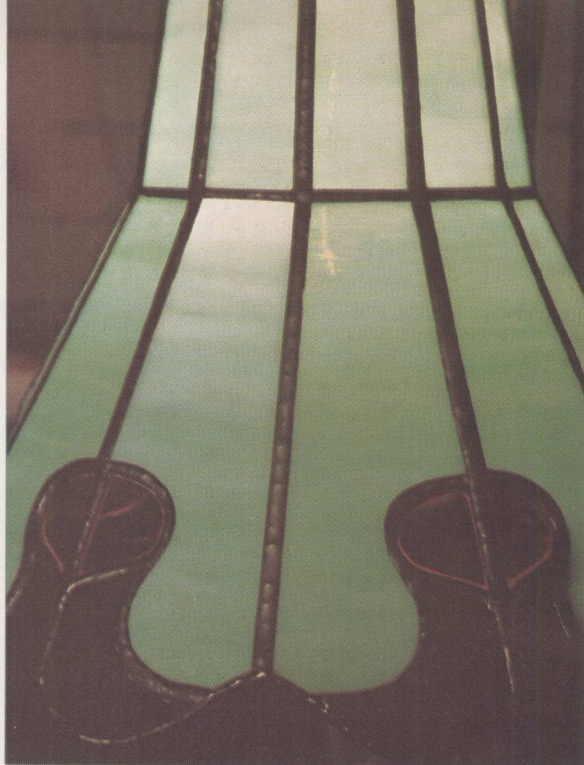
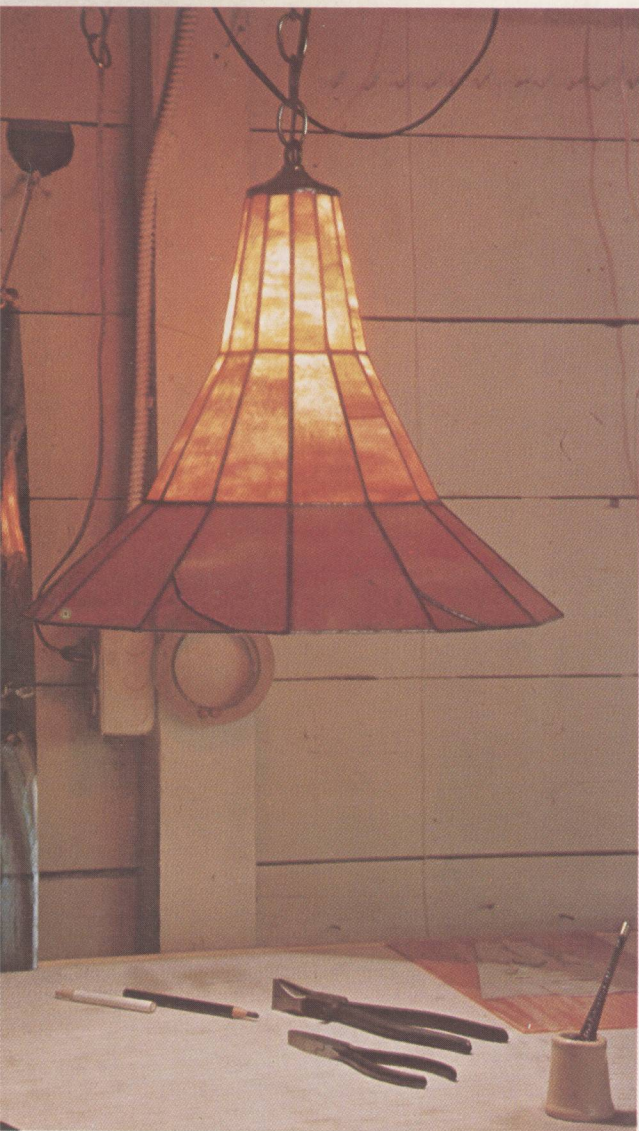
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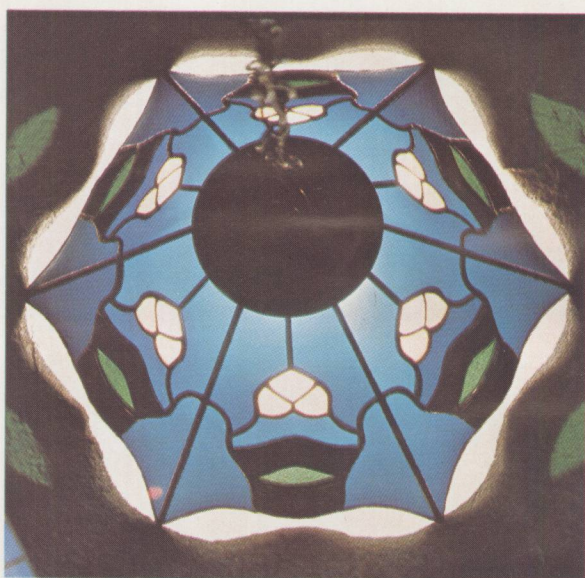
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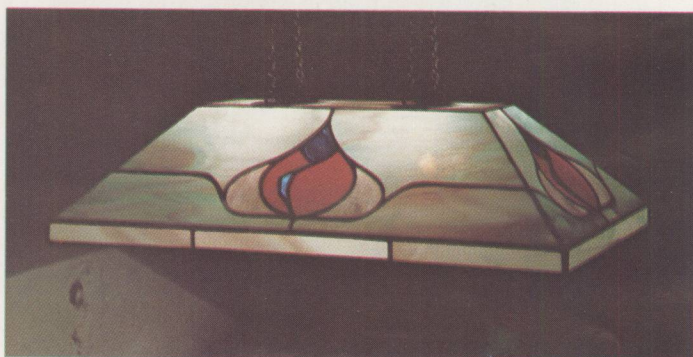
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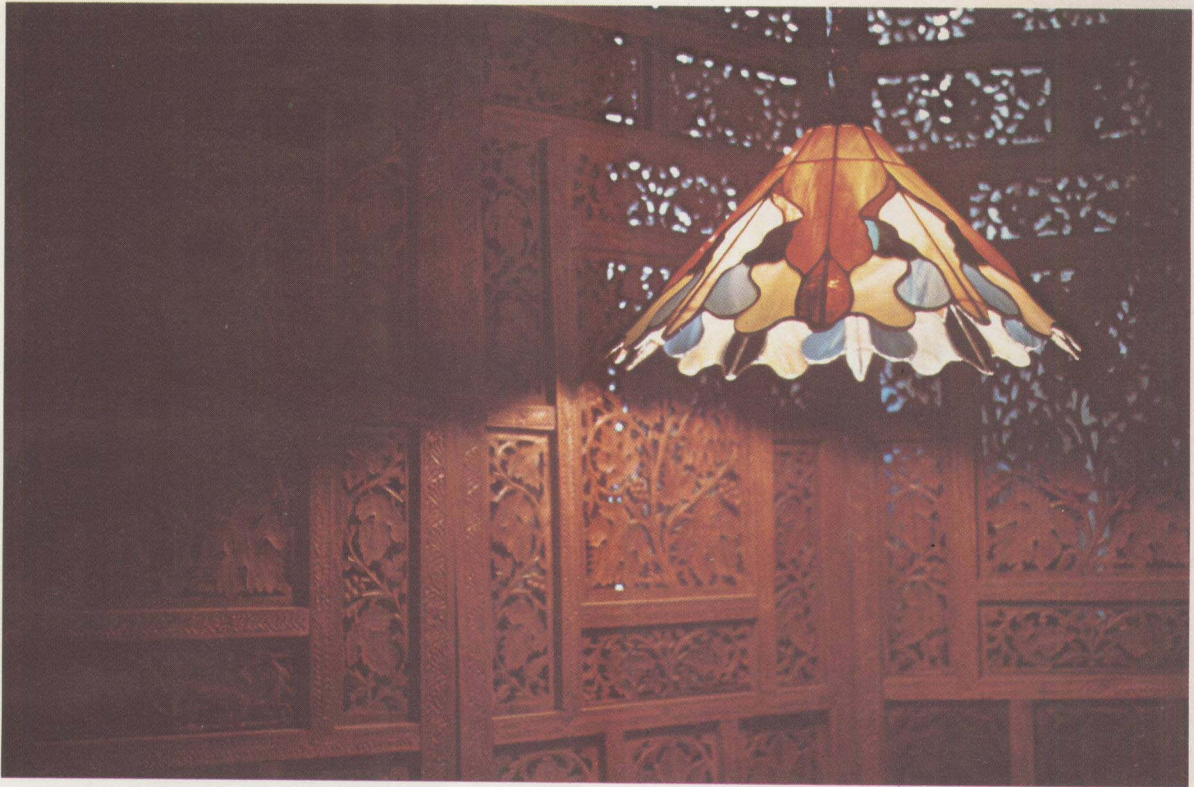


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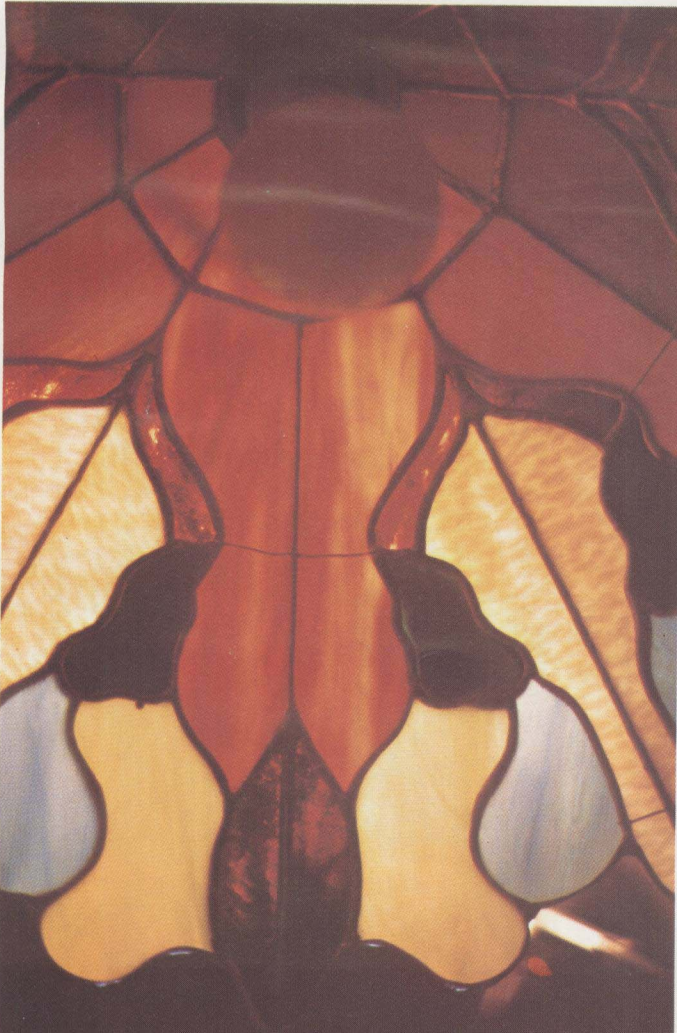


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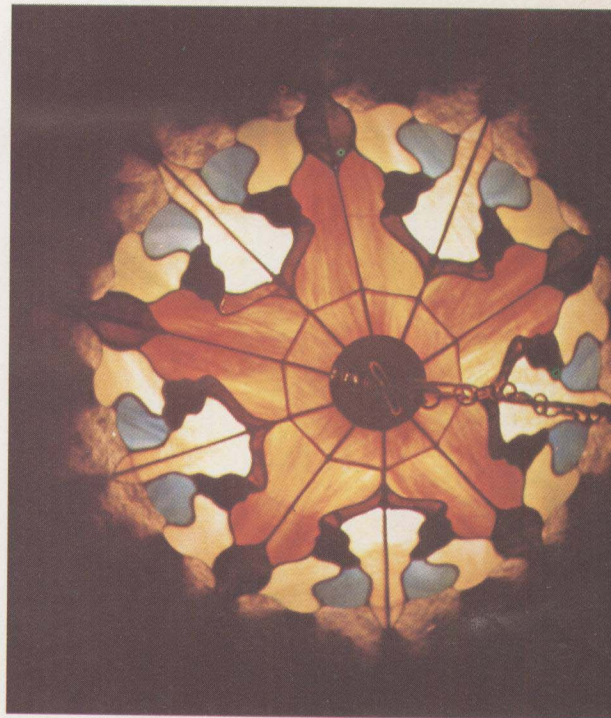




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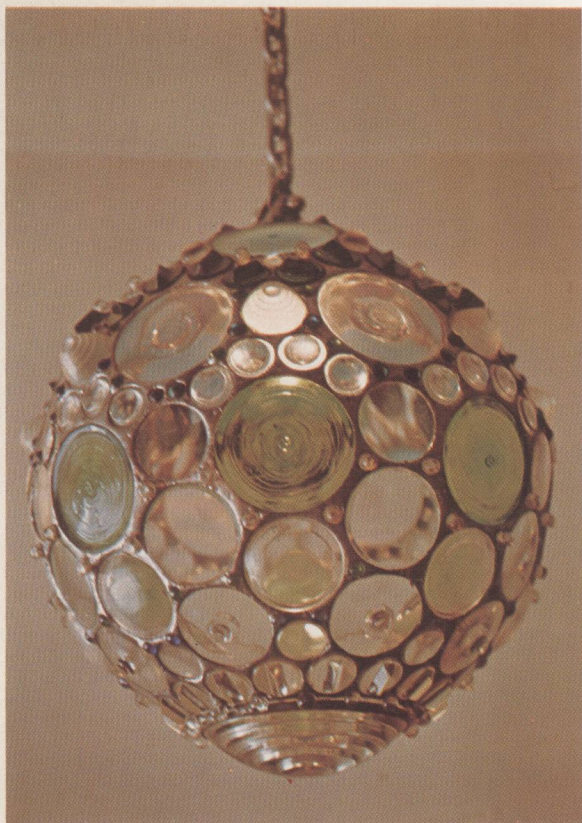
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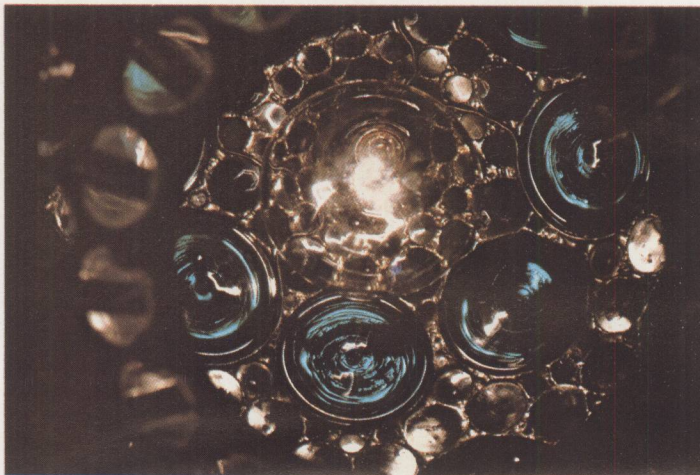
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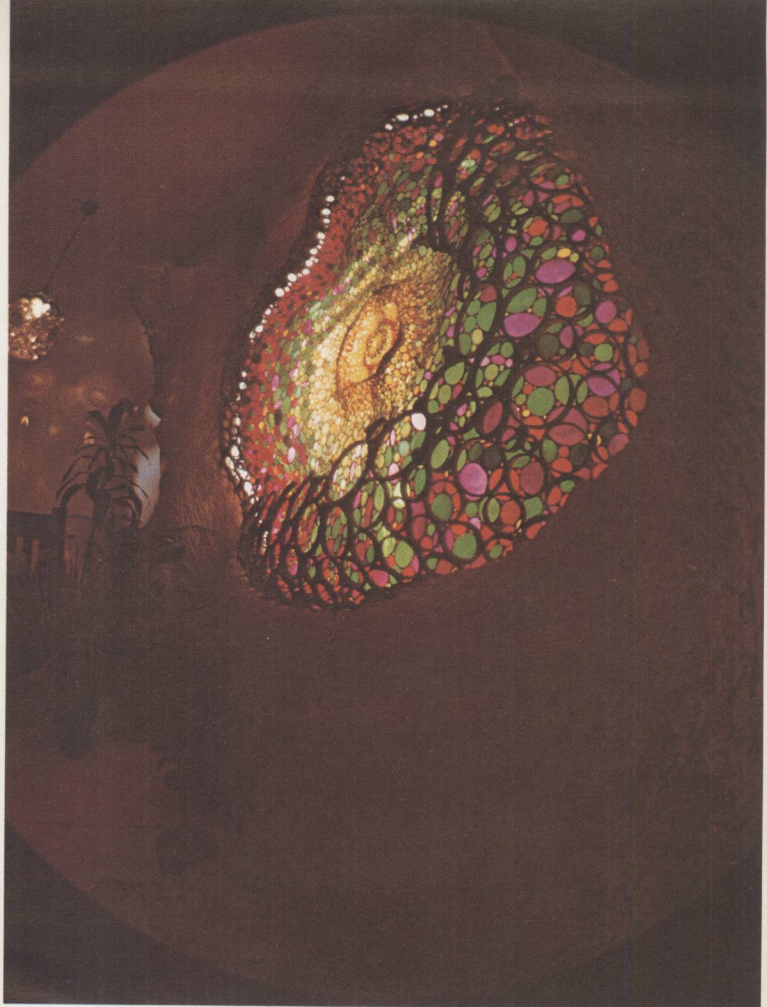
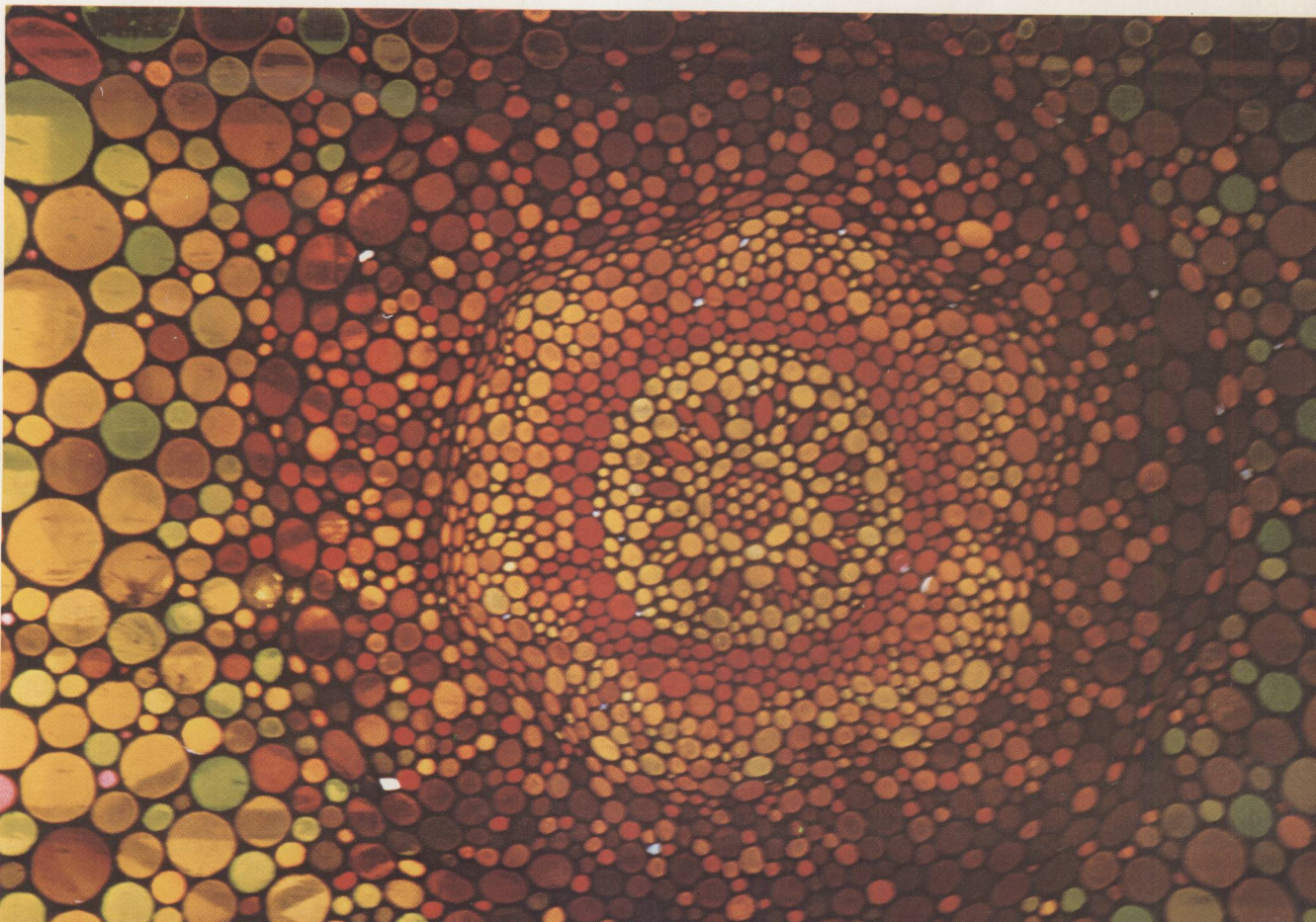


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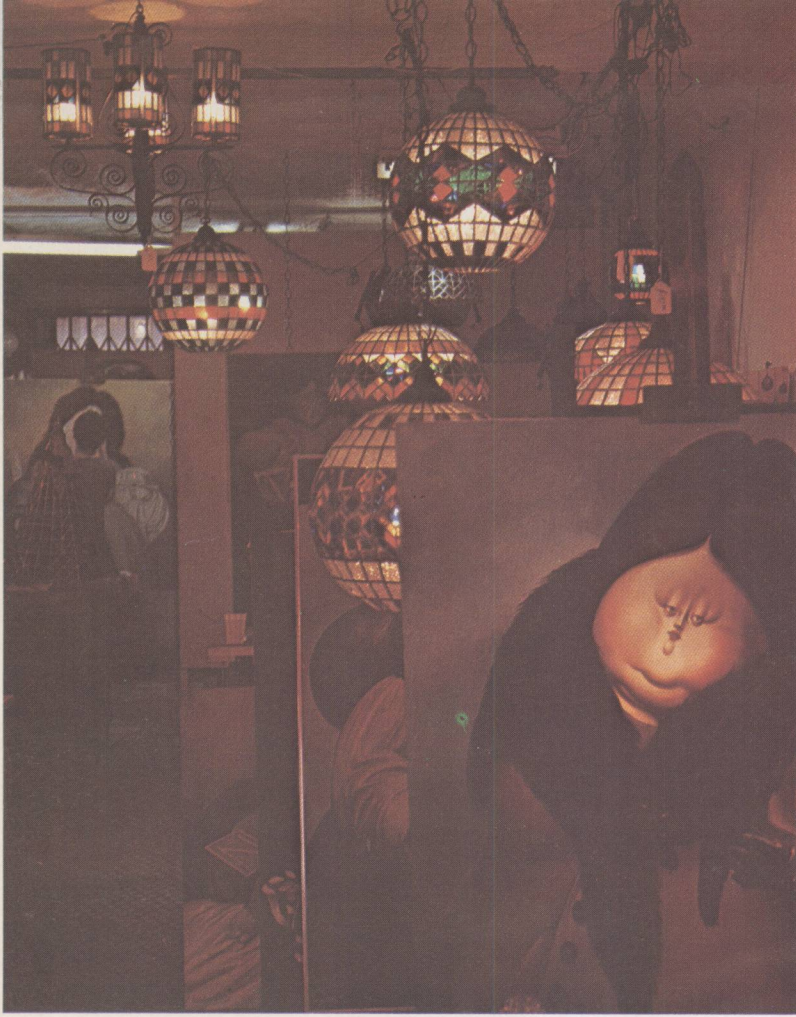


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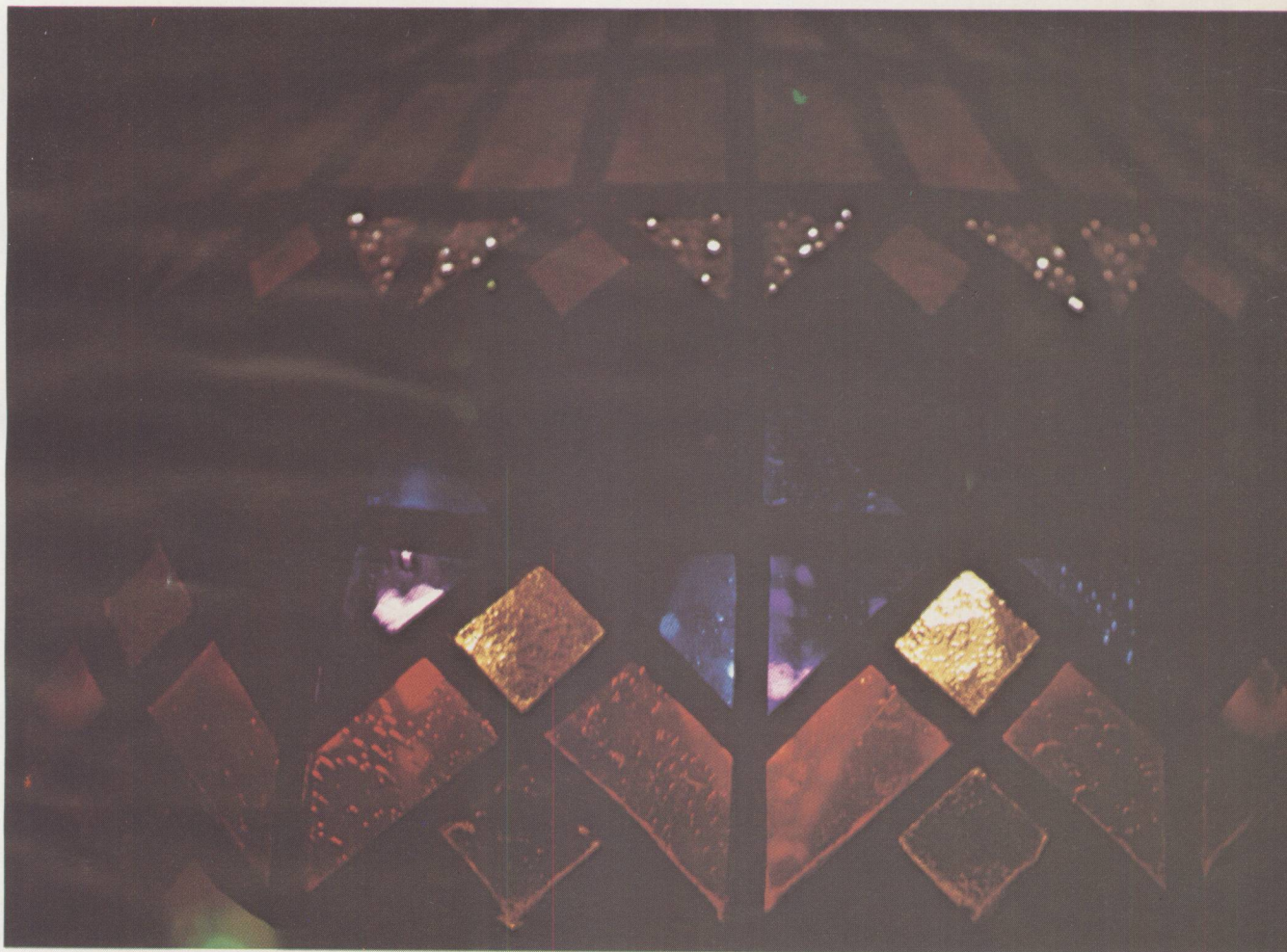


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# **GLASS-WORKS**

**THE COPPER FOIL TECHNIQUE OF STAINED GLASS**

**JENNIE FRENCH**



**VAN NOSTRAND REINHOLD COMPANY**

New York Cincinnati London Toronto Melbourne



For mother, father, Twink, Thor and B.C.

Front cover: Window by Gilly  
Photographs by defrancis

Van Nostrand Reinhold Company Regional Offices:  
New York Cincinnati Chicago Millbrae Dallas  
Van Nostrand Reinhold Company International Offices:  
London Toronto Melbourne

Copyright © 1974 by Litton Educational Publishing, Inc.  
Library of Congress Catalog Card Number 74-12748  
ISBN 0-442-22442-7 (cloth)  
ISBN 0-442-22443-5 (paper)

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United States of America.

Designed by Rosa Delia Vasquez

Published by Van Nostrand Reinhold Company  
A Division of Litton Educational Publishing, Inc.  
450 West 33rd Street, New York, N.Y. 10001  
16 15 14 13 12 11 10 9 8 7 6 5 4

Library of Congress Cataloging in Publication Data

French, Jennie, 1947-  
Glass-works.

1. Glass craft. I. Title.  
TT298.F73 748.5 74-12748  
ISBN 0-442-22442-7  
ISBN 0-442-22443-5 (pbk.)



# Credits and Acknowledgments

Creations in glass pictured in the book are by: Larry Brooks, Jewel Bishop, Jaropolk R. Cigash/Family Guild, Gilly, Ori Halber/Light Industries, Lori Sanchez, Leandro Velasco, and the author. Photographs are by: defrancis/soundandfuryfilm Ltd., Leonard Mastri, Elbrun Revere, Constance J. Russell, William Sears, and the author. Line drawings are by the author, except for the first, which is by H. Russell-French.

I would like especially to thank Laura Kiaulenas, who taught me to draw; Larry Brooks, who taught me stained glass; Gail Aiken, who typed the manuscript; all the photographers and glassworkers who gave their time quite freely, especially Peter DeFrancis; Michael Drons, who edited the manuscript; and my mother, without whom this book would never have been possible.

## Color Pages

**C-1.** Stained glass at S. A. Bendheim Company in New York City. At top, Bendheim's third floor, with its thousands of sheets of imported antique glass and its huge, sliding sample racks. At center and lower left, some imported antique-glass samples. At right, the street level at Bendheim's, where domestic and rolled glass are stored and displayed. If you work with glass, you know about Bendheim's; they literally supply almost everyone in America with stained glass—even Tiffany was a regular customer in his day. (Photographs by defrancis.)

**C-2.** The studio and glass creations of Ori Halber. At top left, a workbench and a lamp. The pliers are cut-running pliers that have specially curved jaws for breaking glass. At top right, a detail of a lamp that is basically the same design as the lamp at top left, except that it lacks the bottom skirt. Notice the excellent soldering work. At center right, another lamp photographed from above. At bottom left, a second workbench and another lamp. On the bench are a soldering iron, a roll of copper-foil, templates, metal shears, and a metal cutting guide. At bottom left, a lamp cut from domestic rolled glass that requires multiple lighting fixtures for proper light distribution. A little over a year ago, Ori used a rough draft of this book and another book on the lead-came method to teach himself stained glassworking. He often uses very large pieces of glass, but his craft level is so high that his lamps are solid without needing additional reinforcing. (Photographs by Sears.)

**C-3.** Three views of a lamp by Jaropolk R. Cigash. At top, the full lamp, cut from domestic rolled glass. At right, an aerial view; at left, an interior detail. Notice the narrow beading. Jerry chose to minimize the look of the

lead bead in this lamp. By doing so, he weakened the lamp's structure, which he compensated for by adding reinforcement in the form of copper wire soldered into the interior joints and base perimeter of the lamp. His work is so good that the reinforcing is invisible and the fragile-looking lamp is solid. (Photographs by Revere.)

**C-4.** The unusual lamps of Gilly. This artist has used everything but sheet glass for these lamps—traffic-light covers, glass doorknobs, jewels, prisms, mirrors, even bottles. At top right, an interior detail of the lamp at top left. (Photographs by defrancis.)

**C-5.** Gilly's large window mural, measuring ten feet in diameter. At bottom, a detail of the mural, slightly flattened by the camera's lens. Gilly began the mural on the floor with a single piece of glass no larger than a nickel. With the help of a few friends, a keg of beer, and tons of popcorn, he raised it to the window. The surrounding wall was shaped to repeat the undulations of the mural. In both lamps and murals, Gilly seems to work without plan or format and makes the almost impossible appear effortless. He does not break rules, but he creates new ones—his own. (Photographs by defrancis.)

**C-6, C-7, and C-8.** The stained-glass lamps of Leandro Velasco. This artist's approach to glassworking is so unusual that it merits representation in this book even though he works in lead came—the alternate method to copperfoil. His beautiful lamps defy the usual problems of mass production. Without sacrificing craft or design, Velasco manages to sell his lamps for about half the cost of other mass-produced lamps. He includes antique and industrial glass (most commercial lamps use only rolled glass), uses multiple lighting fixtures rather than the single bulb commonly found in store lamps, and he creates unusual round and oval shades. (Photographs by defrancis.)







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# PREFACE

Back in 1968 I learned stained glass, ran a studio with two friends in New York, and enjoyed my craft while making a few dollars. Soon after we dissolved the studio in 1970, I began toying with the idea of writing this book. Since then I have had a few more studios and taught several people the copperfoil method of stained glass. Believe me, it is a lot easier to teach someone in person than to write it all down in a monologue. A lot of give-and-take discussion and demonstration gets lost in the translation.

*If you came to me to learn my craft, we could talk about glass for a long while, and then I could demonstrate how simple it is to cut and break glass. I would have you cut your first piece on our first meeting together—taking care to choose a large piece of beautiful antique glass that I knew would excite you visually and surprise and delight you when it broke as easily as a cracker. Once you have cut your first piece, half of your fears are gone, and you can immediately begin to think of glass in terms of its intrinsic possibilities.*

Unfortunately, this cannot be. Let me at least try to answer some of your first questions. The question I am most often asked by my students is what is the difference between this copperfoil technique and the method used for church windows—and which is better? Church windows and many commercial lamps use sections of grooved lead came to hold the pieces of glass together. The only soldering needed with lead came is at its joints. This is a very functional way of joining glass—most suitable for architectural and mass-production work. Lead came, however, is flat and uninteresting in itself. At twenty feet overhead in a stained-glass window, it is fine. My concern in that instance is with the color and design of the glass—not with the aesthetic value of the joining medium.

But at eye level it's a different story. With lamps, window panels, and boxes, your eye immediately notices how the glass is joined.

Here, I feel, lead came fails; it is dull. Were it not for its effectiveness in terms of mass production, not even the greediest businessman would prefer it to the copperfoil technique. With this latter method—the method I use—glass is surrounded by an almost fluid lead line. Far from detracting from the glass, this line has a great deal of beauty in itself. And, in fact, the very manipulation and control of this line often becomes one of the greatest pleasures of the technique.

My students' second-most-often-asked question is a bit more subtle. It concerns design. Usually with their first drawing, they ask, "Why can't I do this design in glass?" My eloquent answer often is, "Just because." Glass is just not all that flexible. You must first learn its limits and then set your mind and talents against these limits. I still find myself designing things that I can't cut, like the hourglass shape. I know that as I am making the last break that I'll probably lose it at its thinnest point—but I try it anyway. Wide to thin to wide—it's always trouble and I always try. That's part of it—trying. Later in the book, I discuss such problems and some possible solutions.

I have put into this book what I feel is immediately important for learning how to work with glass—not just the basics but a lot of fine points. But I have excluded some matters. I recommend a couple of ways of breaking glass while holding it with both hands. But I make no mention (except here) of breaking glass off the edge of a table or a workbench. I've done this because I honestly feel that you learn more about glass by holding it in your hands. Another moot point concerns soldering three-dimensional objects. In this book I recommend constructing forms to hold the object as you solder and yet I often don't use forms myself. If I solder the outside joint of a lamp while holding it in my lap, I am fully prepared to receive a stunning solder burn if a drip rolls onto my leg. Forms all but eliminate this possibility, so I felt I should recommend the safe way only.

Enough of this preface. Turn the page and I will do my best to teach you what I have spent many happy years learning—the copperfoil technique of stained glass. And—please have fun with it.

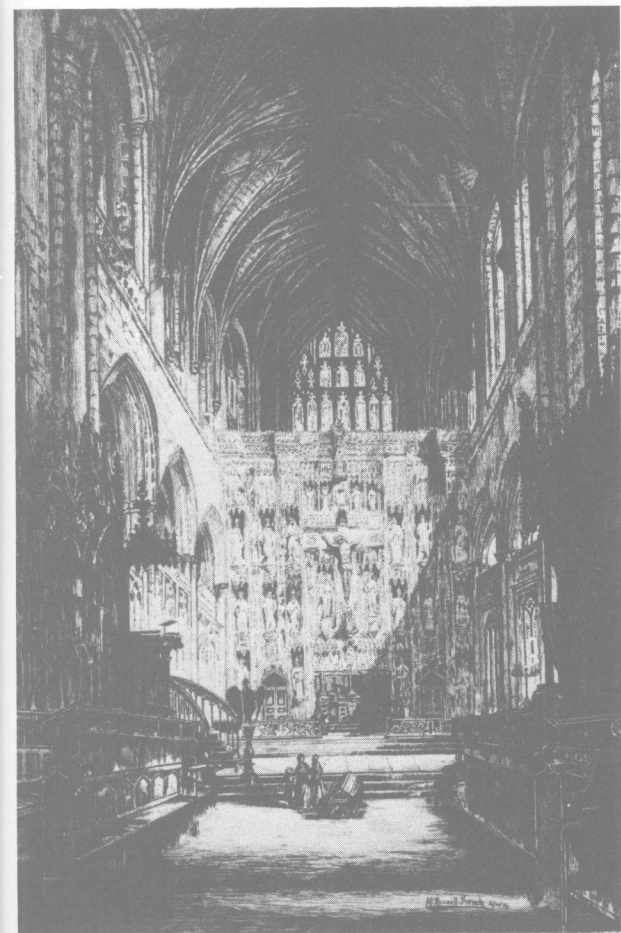


## Chapter 1:

# COLOR

## Color and Emotion

Light, magician of illusion, passes through glass—touching, expanding, filling, transforming space—and uses color to create and control what it illuminates.



III. 1-1

Pen and ink sketch of Chartres Cathedral in France by H. Russell-French.

In spite of the electric light, our instinctive reactions to color, in terms of day/night, remain primitively intact. Day means increased activity (*Homo sapiens*, the hunter), and night means decreased activity (*Homo sapiens*, the hunted, huddled in his darkened cave). It has also been substantiated that our heartbeat, pulse, and respiratory rates are dramatically affected by colors, speeding up for pure red, for example, and slowing down for blue. For centuries, color has been used to guide and control thinking—from the mundane to the magnificent. Small wonder, then, the quiet and profound nature of the temple interior with its rich but muted stained-glass colors—it was planned that way.

What we are dealing with is not so much decoration, but the creation of an emotional environment through the interplay of glass and living light. For a moment, imagine a wooded area during the height of summer, and its moods—in terms of color—as the lighting changes:

just before sunrise when white clouds of steam rise up from marshes and moist ground like great ghost fingers against a purple-blue sky. . .

sunrise-diamonds and rainbows of dew, covering everything with bright wetness. . .

high noon, drained and exhausted by its own enveloping heat and moisture—everything dies for an hour. . .

toward sunset, relief brought by slanting rays of sun, deepening and subduing colors while the lengthening shadows make dark shapes appear and disappear in the corners of the eye. . .

sunset throws a great celebration for color, while a hushed forest silently prepares for things that not only gobumpinthenight, but glow, flash, and illuminate as well.



You already have an emotional awareness that belongs solely to you and your experiences—think about your reactions to situations and locate these colors and forms. You might begin with simple unpretentious ideas, but, if the mystery of glass catches you, the translucent walls of your imagination will fill large windows. (The same Louis Comfort Tiffany who inspired the exquisite stained-glass Tiffany lamps also produced a twenty-seven-ton drop curtain containing nearly one million pieces of glass for the National Theater in Mexico City.)

## Color Rules

More than two centuries ago, an English physicist by the name of Isaac Newton astounded the world with his discovery that pure “white” sunlight actually contained every color seen by man. He proved his point with two simple prisms. The first spread sunlight into a full-colored spectrum; the second converged all the colors back to white light. There was no doubt that the colors were in the light, and not in the prisms. Like many great discoveries, Sir Isaac’s met with a good deal of skepticism and even more righteous indignation—a lot of it from artists. You see, for hundreds of years anyone who worked with pigments, dyes, stained glass, or any colored material knew that white was the absence of color. Mixing every color on a palette produced black—not white.

Newton went further and claimed that the primary colors—from which all others could be derived—were red, blue, and green. Indeed, these three colors dominated the spectrum produced from his prism. Artists knew, however, that *their* three primary colors were blue, red, and yellow. No possible combination of Newton’s three primaries could produce yellow—and they could prove it. . . .

This is not the place for a long scientific and philosophical discussion of who was—and is—right. For our purposes, suffice it to say that both schools are right. Color rules based on light conflict with color rules of pigment. New-

ton could take a beam of red light from his spectrum and overlap it with a beam of green, and he produced yellow. An artist can take red pigment and mix it with green, and he gets a very dark brown. The simple answer is that colors are indeed in light. Take the reddest apple into a dark closet, and it has no color. But the colors in light when reflected and absorbed by a surface (paints, glass, etc.) conform to what we know as pigment rules.

Since stained glass follows the rules of pigments, it is these rules that concern us here. Our entire range of color basically consists of three colors that enjoy a simple relationship to each other. Understanding these relationships is vital to using them when doing stained glass.

The three colors are:

RED BLUE YELLOW

and they combine to make:

RED + BLUE = PURPLE

BLUE + YELLOW = GREEN

YELLOW + RED = ORANGE

As these colors combine in various proportions, they pass through all their different hues:

RED, reddish-purple;

PURPLE, purplish-blue;

BLUE, bluish-green;

GREEN, greenish-yellow;

YELLOW, yellowish-orange;

ORANGE, orangish-red.

Furthermore, every color has an opposite color, called its **COMPLEMENT**:

RED—GREEN

BLUE—ORANGE

YELLOW—PURPLE

When complements are added together, they make different hues of brown:

RED + GREEN = very dark BROWN

BLUE + ORANGE = medium dark BROWN

YELLOW + PURPLE = dark BROWN

To clarify these rules for yourself, hold a piece of red glass over a piece of blue glass and examine the resulting purple; then combine a blue with a yellow. Next place a red over a green and obtain dark brown.