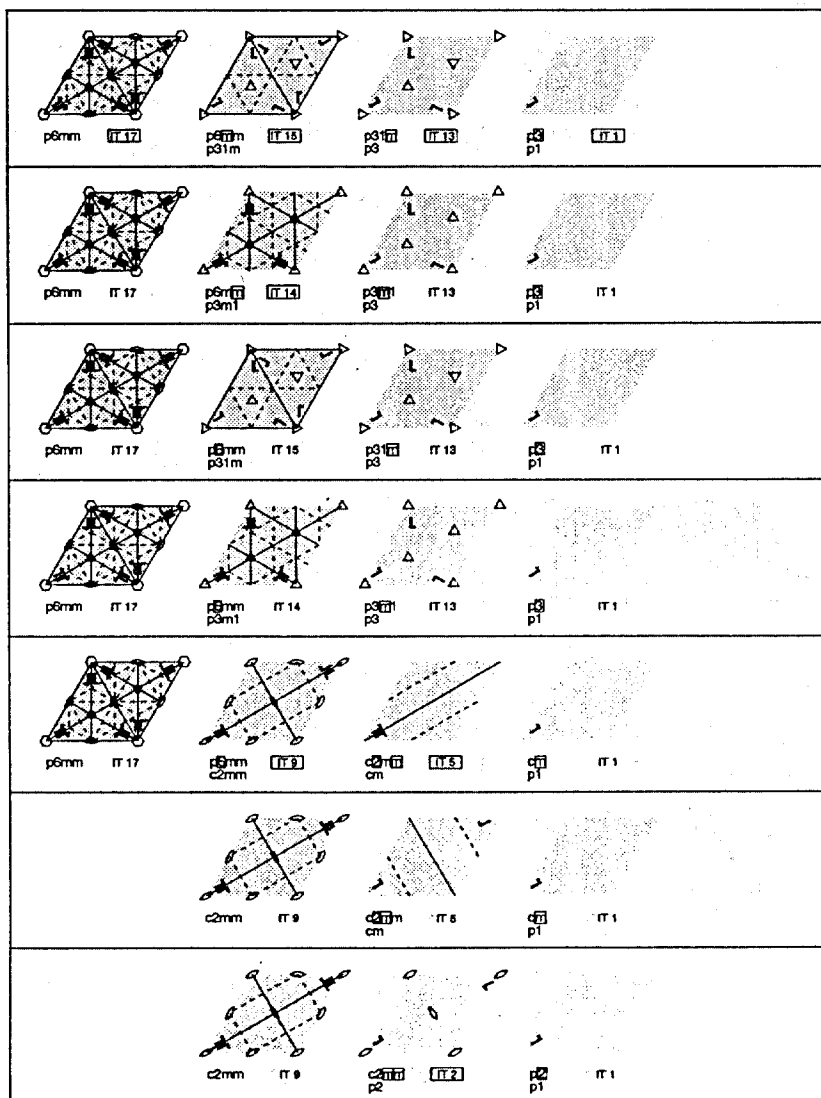


UPDATE: A GRAPHIC DERIVATION OF THE 13 SYMMORPHIC WALLPAPERS WITH A NOTATION ABOUT THE FOUR NONSYMMORPHIC ONES

Pamela K. McCracken and William S. Huff

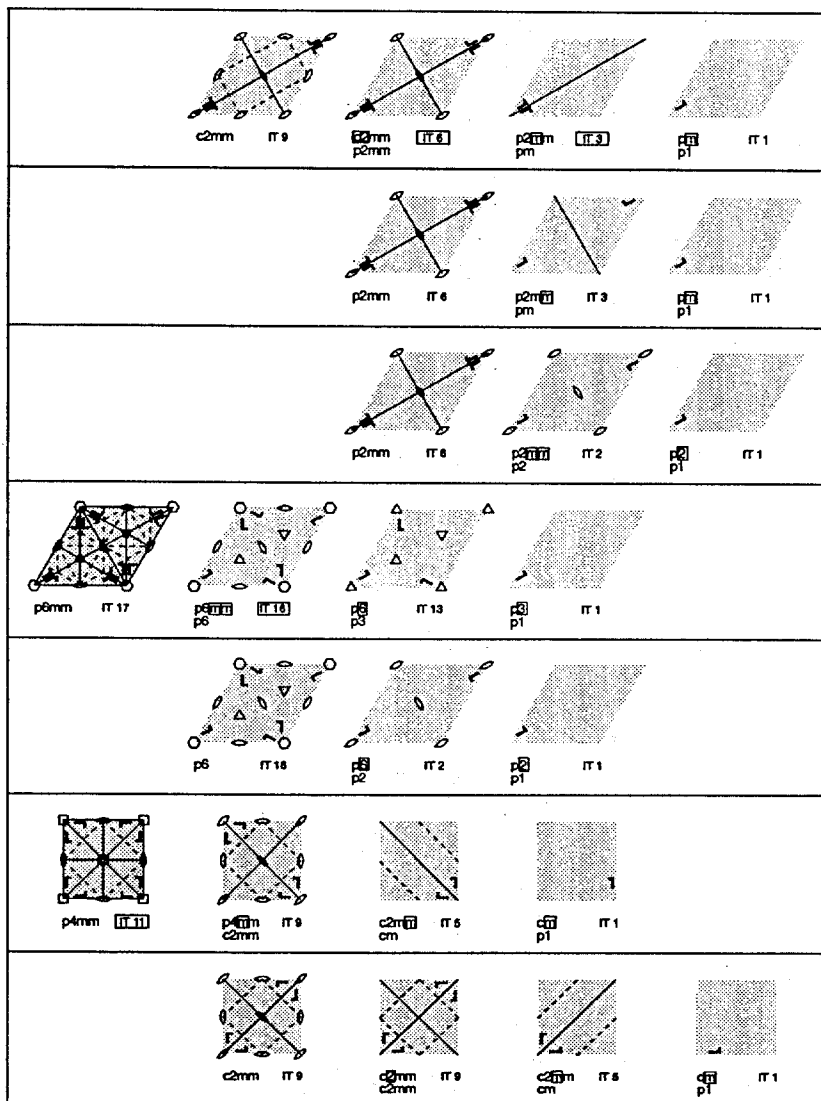
Department of Architecture, State University of New York at Buffalo
Hayes Hall, Buffalo, NY 14214, U.S.A.

3.1.1



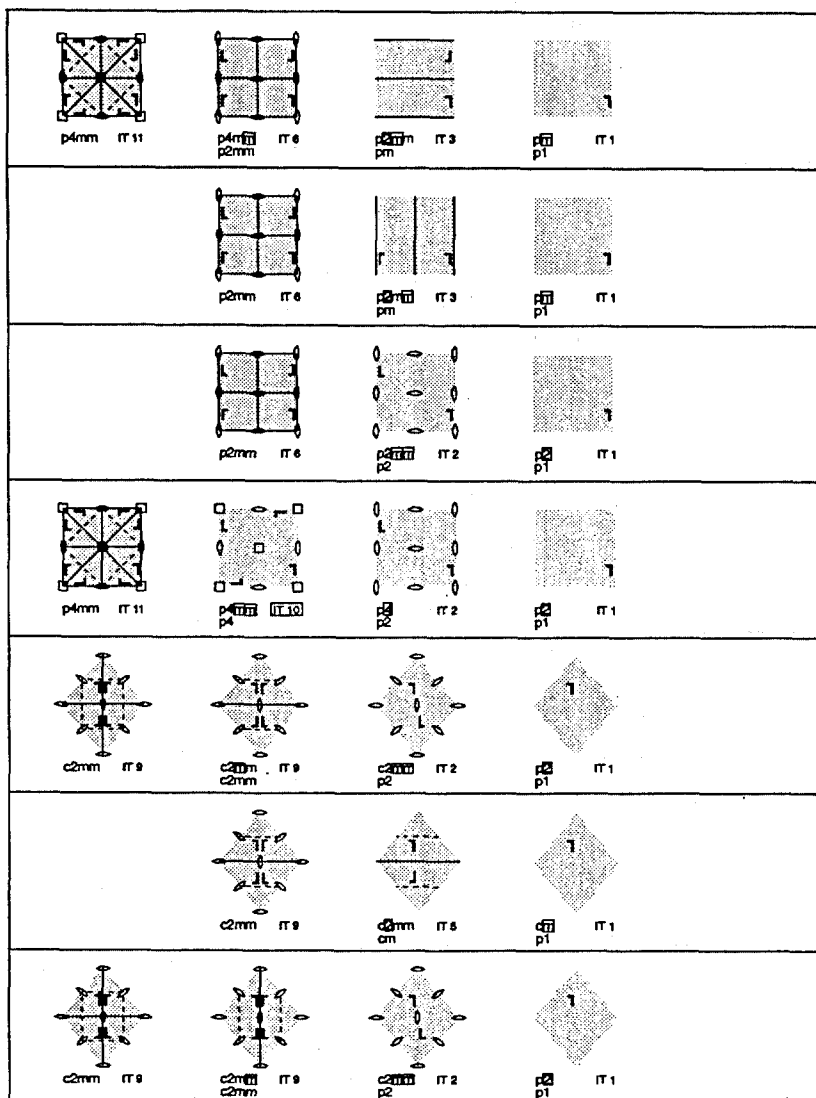
Taking up the approach that appears in Wolf and Wolff's *Symmetrie*, this graphic presentation develops the 17 wallpapers in reverse to the manner in which most texts develop the order of derivation of the patterns—from the most highly symmetrical to the least. First, a planar lattice is shown with all the elements of symmetry that it can support; then a motif element is introduced into it, producing the holomorphic pattern for that lattice.

3.1.2



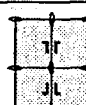
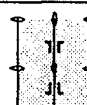
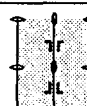
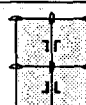
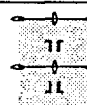
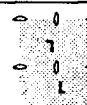
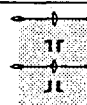
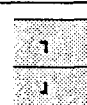
Next, each element of symmetry is eliminated—in a combinatorial manner—until the most basic pattern appears. In fact, all 13 *symmorphic* patterns are, to no surprise, derived after working through all combinatorial combinations on only the specific 60°-120° rhombic and the square lattices. However, in discharging the demand for closure, the general rhombic, rectangular, and parallelogramic lattices are similarly treated.

3.1.3



A similar table has been developed in order to derive the remaining four *nonsymmorphic* patterns. In this case, all possible substitutions of the mirror-reflections with glide-reflections are combinatorially explored. The length of this table is even longer than the length of the table needed to derive the 13 *symmorphic* patterns.

3.1.4

 $c2mm$ $\pi 9$	 $c2mm$ $\pi 5$ cm	 $c2$ $\pi 1$ p1	
 $p2mm$ $\pi 8$	 $p2mm$ $\pi 8$ $p2mm$ $p2mm$	 $p2mm$ $\pi 2$ $p2$ $p2$	 $p2$ $\pi 1$ p1
 $p2mm$ $\pi 8$	 $p2mm$ $\pi 3$ pm	 $p1$ $\pi 1$ p1	
 $p2mm$ $\pi 8$	 $p2mm$ $\pi 8$ $p2mm$ $p2mm$	 $p2mm$ $\pi 2$ $p2$ $p2$	 $p2$ $\pi 1$ p1
 $p2mm$ $\pi 8$	 $p2mm$ $\pi 3$ pm	 $p1$ $\pi 1$ p1	
 $p2$ $\pi 2$	 $p1$ $\pi 1$		