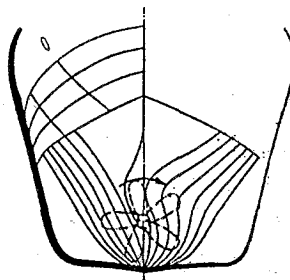


Black-and-white (antisymmetric) tiling and textile patterns

Endrei, Walter

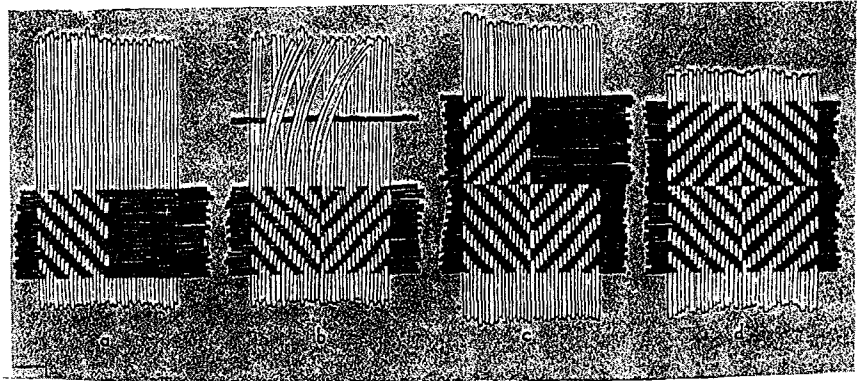
Common-sense will have it, that in the domain of technology - either procedure or material - symmetric structures ought to be preferred. A short survey undeceives us: often asymmetric designs are favoured, sometimes they offer the only solution. Reasons for this solution are obvious and manifold: biological facts like dexterity of man, as well as the important role of rotation in mechanics or molecular properties of certain crystal lattices.



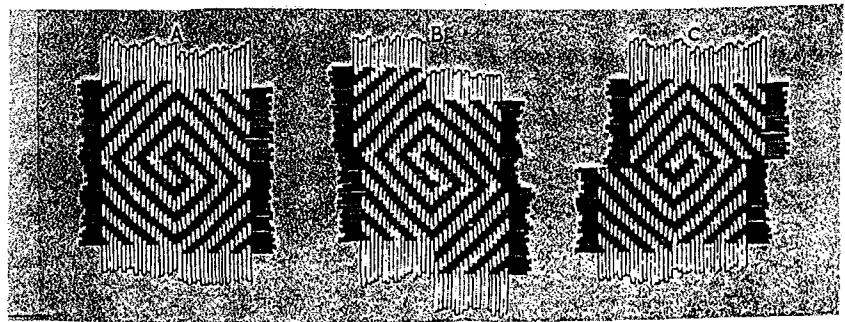
The latter ones - containing impurities - may serve us as a starting point into a technique of manufacture which, since prehistoric times has had an immense influence over the patterns of ceramics, architecture, leather-work etc. This is the plaiting and later on the weaving of patterns.

In order to explain our argument it is necessary to acquaint you with the notation of weaving-design. The two system of yarns - warp and weft are represented by different colours (usually black/white) and the gap between them is neglected. Consequently the sketch transferred to a cartridge-paper may serve as a more or less true image of the fabric, provided that warp and weft have different (but otherwise uniform) colour.

Reverting to our starting point, - structural faults, - a small example will elucidate our idea. If we take a simple twill and rotate it in the quarters of the pattern - as it is quite ordinary in basket - weaving - we shall get a diamond-twill.

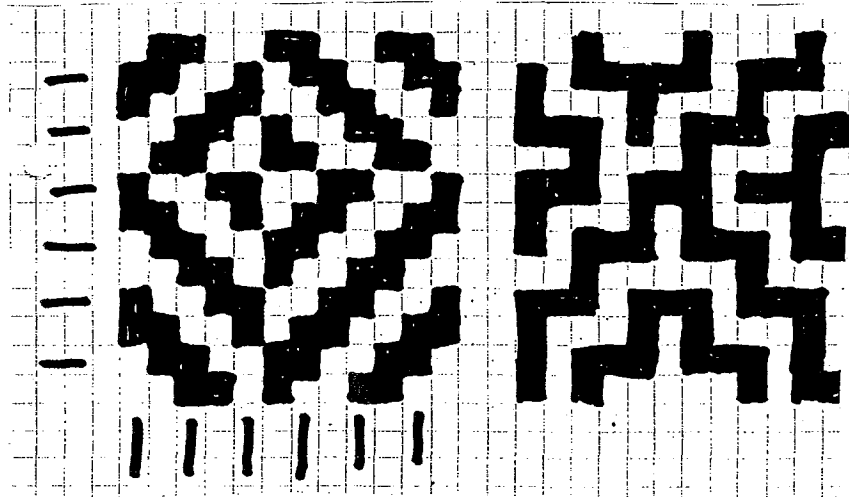


If the weaver misses the order of succession by two yarns only, he will get a meander, even in several varieties.

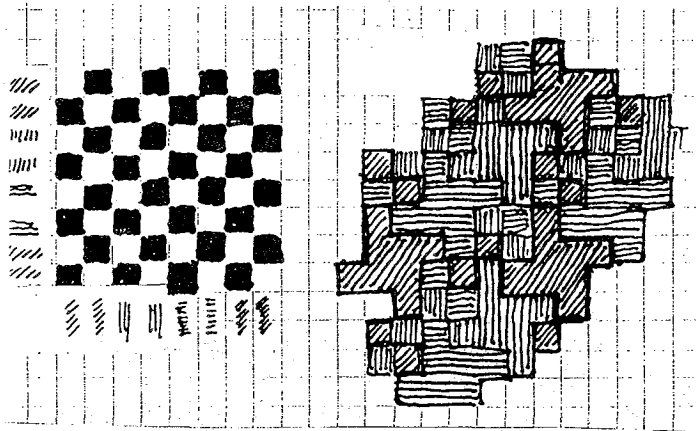


A special case of symmetry is that of black and white tiling, which is characterized by two identical surfaces being complementary to one another. They are omnipresent in human culture, we find them on leather-intarsia of Altai-people of the 5th cent. B.C., in Roman mosaic/work and recent Mexican coloured-woven fabrics likewise. Tracing back their origin, we can show, that most of them are derivable from matting- or plaiting work and weaving.

Let us take the aforesaid example of twill with the difference, that both the warp and the weft yarns are alternately black and white: we get now a rather sophisticated pattern with no resemblance to the diamond twill. But if we took a simple twill, or a broken twill the result would be in most cases a splendid black and white tile pattern.



Varying them, we may get as good as all occurring variants of this symmetry-type; especially twill bindings are prone to produce them. Even three-colour combinations can offer such patterns



It would be a fascinating task for topologists to prove under which conditions turns a black and white tiling symmetry up. There also exists a method to reconstruct original weave and yarn order a given pattern.