Figure 1: Random square lattice patterns used in the short term memory experiments. The images are constructed by slightly distorting a square lattice pattern of 3 × 3 cells (top row), 4 × 4 cells (middle row) or 5 × 5 cells (bottom row). For simplicity, it will be assumed that the complexity of such images, in bit numbers, is equal to the number of cells. In each pair of images, there is a single mismatch in the black or white value of a quadrangle, between the left and the right images. The images are assembled two by two in the repeated mode (left column) or the symmetric mode (right column). In this case, two conditions were studied: images separated as in the repetition condition (top and middle pair, right column), and images juxtaposed at their symmetry axis. The images were presented on a monitor screen and each image subtended a visual angle of about 7 degrees for a subject having his/her eyes at about 60 cms from the screen.

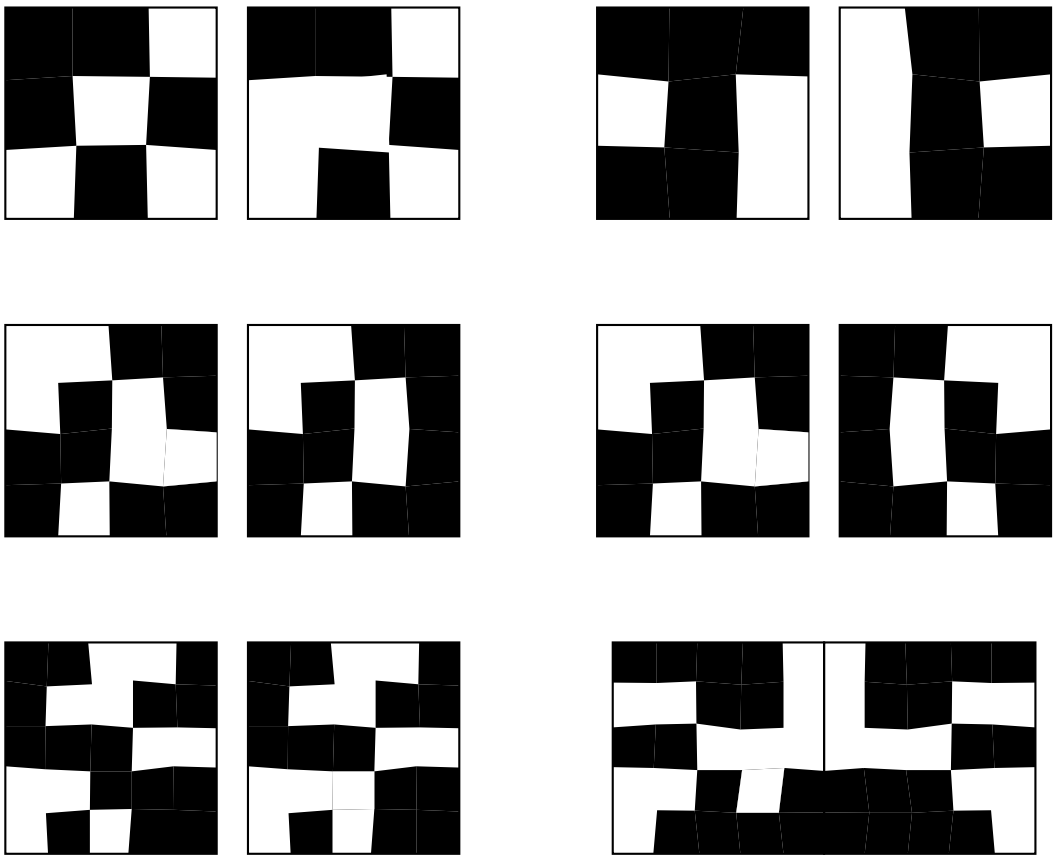
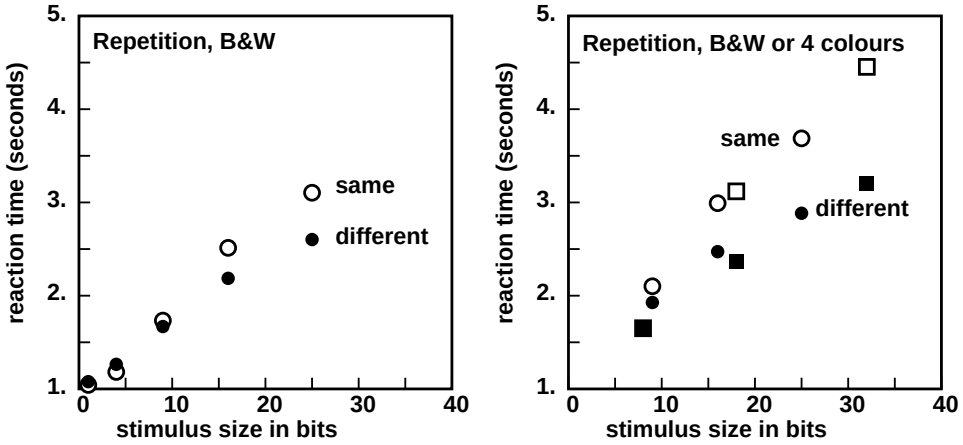


Figure 2: Reaction times for comparing images side by side. The upper left panel reproduces the results in [21]. Typical stimuli are shown in the left side of Figure 1. As the images to be compared grow in complexity, the "same" responses become appreciably larger than the "different" responses. The split occurs around 12 bits. The position of the split is taken as a measure of the amount of information captured by the brain in a single glance and maintained in short-term memory as the eyes jump from one image to the other. In a subsequent work, reported in a congress abstract [24] 18 subjects performed comparisons on black and white or colored patterns, or arrays of letters. In the top right panel, the black and white results are represented with filled or unfilled circles, and the four colors results are represented with filled or unfilled squares.11,000 reaction times (RTs) were determined in the black and white experiments, 12,000 RTs were determined the 4-color experiments, and 33,000 RTs were determined in the letter comparison experiments. In this case there were three series of tests, with overlapping complexity ranges.



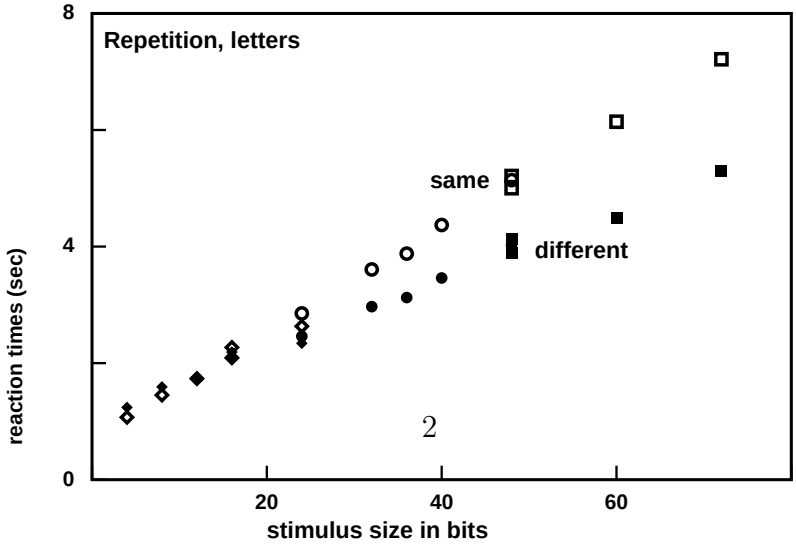


Figure 3: Time to detect a repetition or a symmetry violation as a function of the column position in the matrix patterns and the size of the images. The columns are numbered from left to right in the repetition experiments, and from the symmetry axis outwards in the symmetry experiments. Square symbols: 3 3 images; disks: 4×4 images; diamonds: 5×5 images. There were 18 subjects in the repetition experiments, and a total of 5,800 reaction times were recorded (same data as in the top right panel of Figure 2). There were 12 subjects in the symmetry experiments, and a total of 20,300 reaction times were recorded. The reaction times were averaged over the 'separate images' and the 'no separation' conditions.

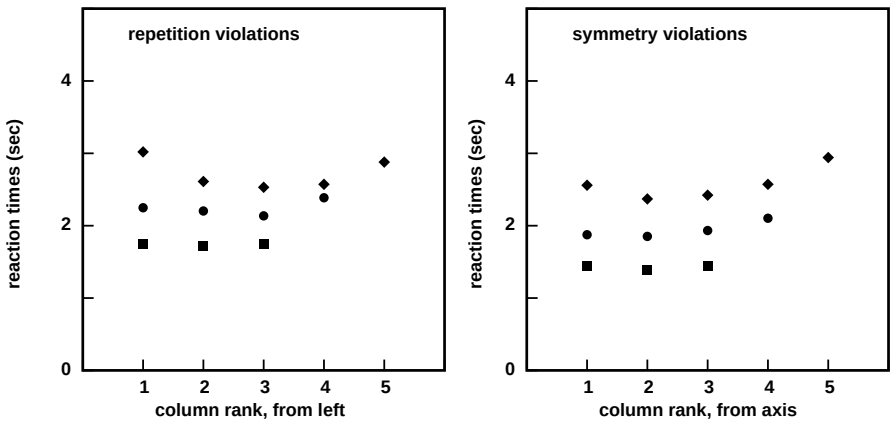


Figure 4: Reaction time distributions. The experiments were performed by the author, under the repetition (16,000 RTs collected), the 'symmetry without separation' conditions (13,000 RTs collected) and the 'symmetry with separation' condition (11,000 RTs collected). The areas shaded in grey represent the histograms for the reaction times distributions, taking a 50 ms bin width. The black areas represent the RT distributions for the erroneous responses. The curves represent a fit with a kinetic model involving a lag, two elementary kinetic steps, and a convolution with a gaussian. The fitting parameters are shown in Table 1.

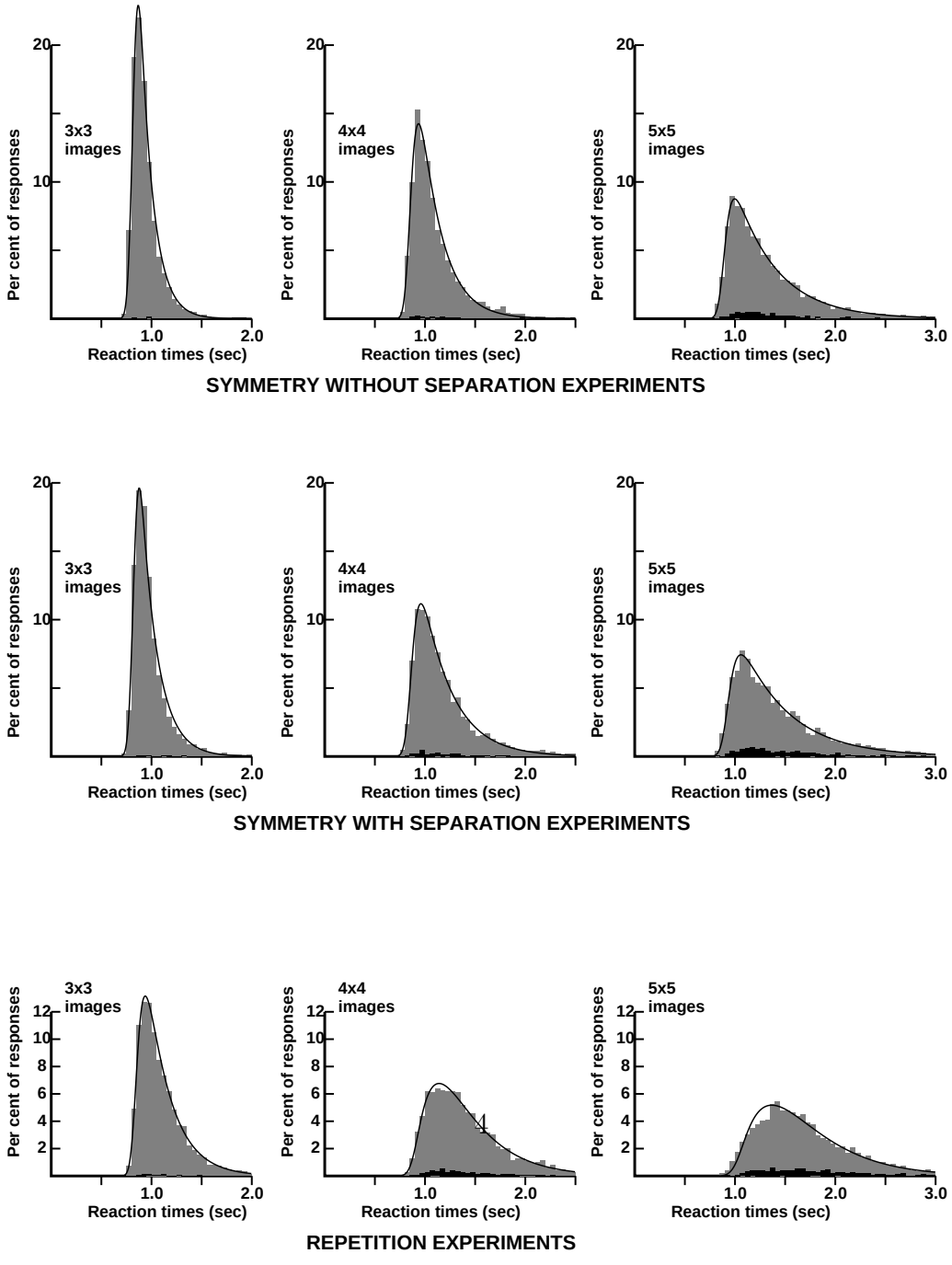


Figure 5: Colored strips, with hue variations. All strips except the bottom pair on the right contain the same patterns, represented with different colors. The colors are differentiated along a red-green axis in the top left pair, along the cyan-magenta axis in the top right pair, and along the red-blue axis in the bottom left pair. Strips forming a pair are shown assembled in a triptych with two local axes of symmetry in Figure 6. The pair of strips at the bottom right use the same colors as the pair in the top left. They have the peculiarity that the colors are matched exactly on the left and right borders. They are shown assembled in triptychs in Figure 7.

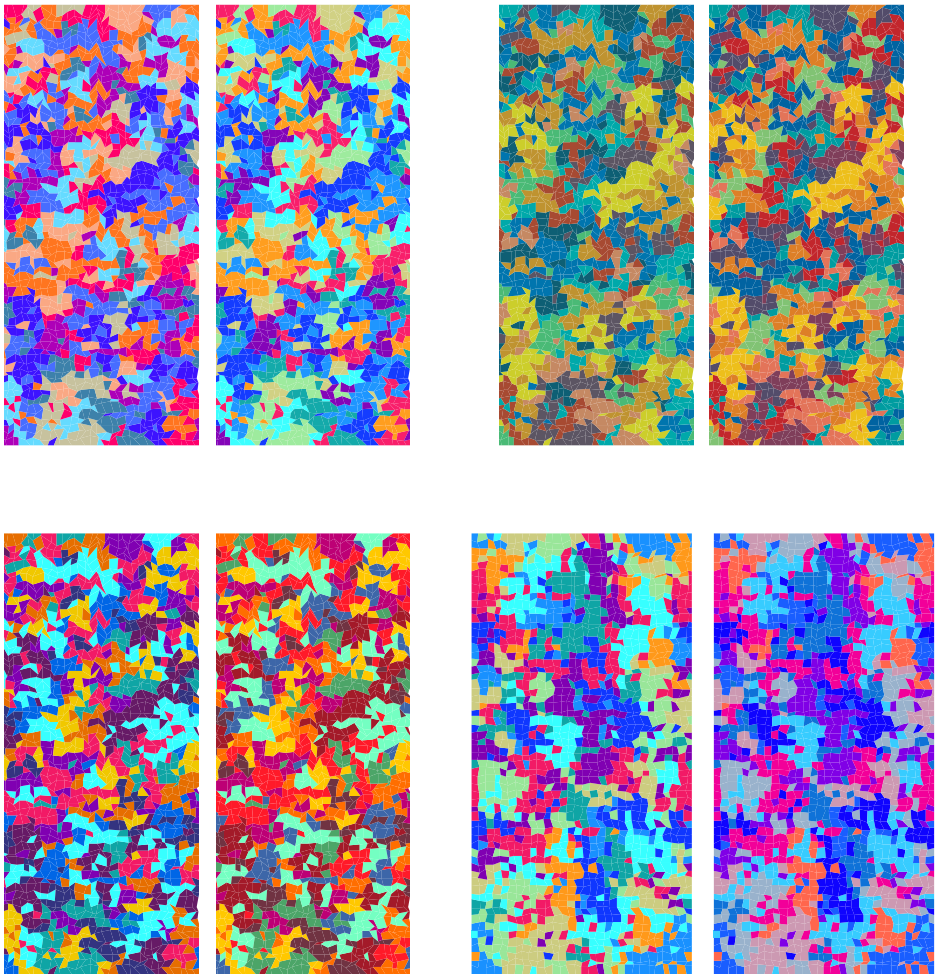


Figure 6: Color equalization effect. Each of the three figures was constructed from a pair of strips from Figure 5, one of the two being used in its mirror-image form. Tryptichs were constructed by putting one strip in the centre, and two copies of the other strip on the left and right sides, thus creating two vertical symmetry axes. Color differences across the symmetry axes may be less salient than in the separate strip presentations of Figure 5.

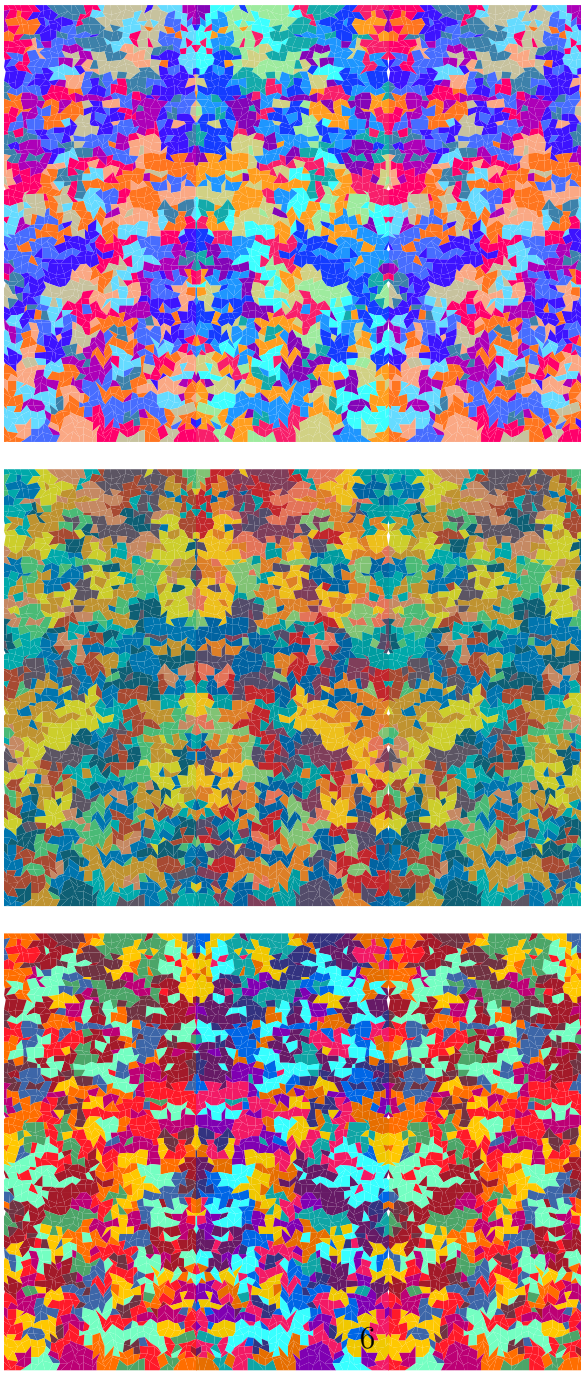


Figure 7: Symmetry versus repetition in color equalization. Tryptichs were constructed using the bottom right strips of Figure 5. They are assembled by symmetry in the top figure, as in Figure 6, and by repetition in the bottom figure.