VisonLab <sup>tm</sup> is a set of user-modfiable vision demonstrations and experiments, many of which are presented in Stereoscopic. It is a teaching tool designed for Introductory and Experimental Psychology; Sensation and Perception.

It is flexible and easy to use with a menu-driven program that permits you to set up a teaching laboratory in as little as half an hour.

There are two parts. The first part consists of demonstrations and the second consists of psycho-physical experiments.

**Demonstrations**: A partial list is illustrated below and a complete list in the dialog that follows:

**Illusions**: Muller-Lyer, Ponzo, Poggendorff, Color Assimilation
**Apparent & relative motion**: Phi phenomenon, motion recruitment, motion in depth, cycloid motion
**Stereo forms**: disparity-biased Necker cubes, tilted & rotated bars, Random dot stereograms: static, dynamic & moving
**After-effects**: McCollough, motion
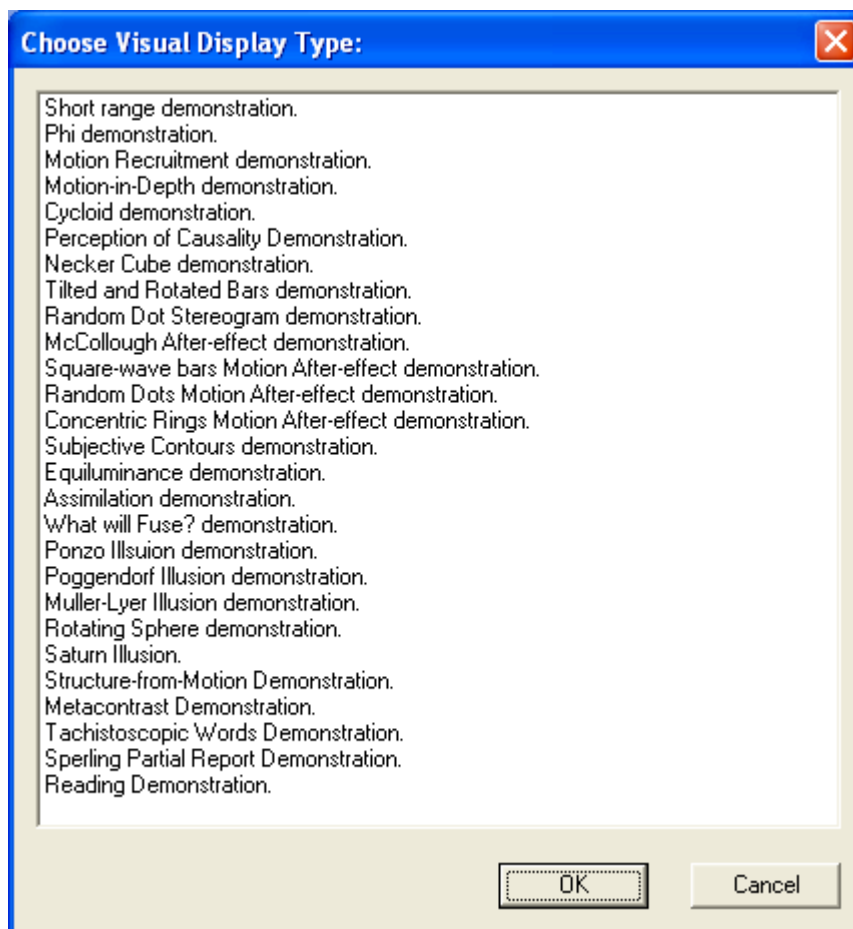**Kinetic depth**: rotating sphere, Saturn illusion, structure from motion
**Subjective contours**: static, stereo apparent motion, & rotating subjective squares
**Equiluminance**: heterochromatic flicker, various illusions, square & circle interposition
**Fusional/rivalrous stimuli**
**Tachistoscopic demos**: Sperling partial report, metacontrast masking
**Reading demos**

Each of the demonstrations has a dialog box associated with it permitting the user to modify key parameters. For example, consider the color assimilation demonstration (space between colored lines is pure white, not colored as it appears).

There is a dialog which permits changing the width of the lines, the color of the lines and the radius of the circle.
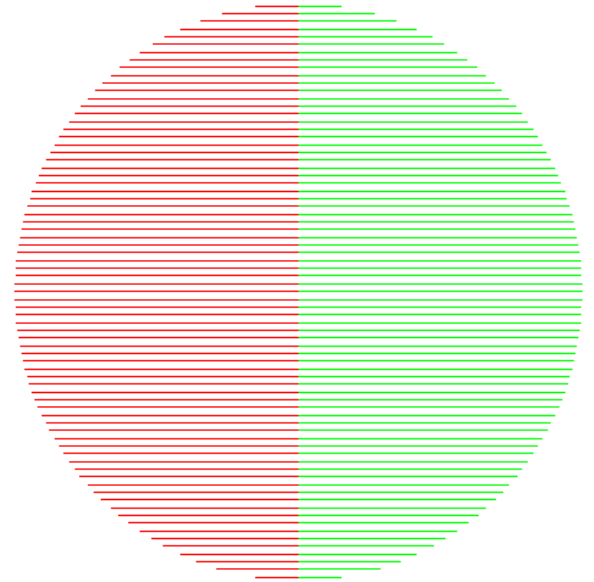
**Assimilation Parameters**

Radius (mm)  75

Separation (mm)  2

Modify Colors

OK          Cancel

Note that pressing the "Modify Colors" button brings up a new dialog, which allows color specification in several different units, including CIE coordinates and cone contrast units.

**Colors**

Background Color

LUT
Red  0-255          Green  0-255          Blue  0-255
0                   0                     0

RGB percentages
Red%  0.0000-100.0000   Green%  0.0000-100.0000   Blue%  0.0000-100.0000
0.0000                  0.0000                     0.0000

CIE
X  0.3300-0.3300     Y  0.3300-0.3300     Lum  0.0000-92.9800
0.3300               0.3300               0.0000

CONE EXCITATION
Short  0.00000-0.00000   Medium  0.0000-0.0000   Long  0.0000-0.0000
0.00000                  0.0000                   0.0000

OK          Cancel

Other demonstrations permit even more extensive stimulus modifications. For example, the subjective contour demonstration has the basic mode as illustrated here, but also has a stereo mode in which the square that is not really there appears to float above the screen, a dichoptic mode in which the "pac-men" figures are presented to different eyes, and an apparent motion mode in which the pac-men figures change back and forth to give the impression that it is the square that is not there moving back and forth—not the pac-men figures.
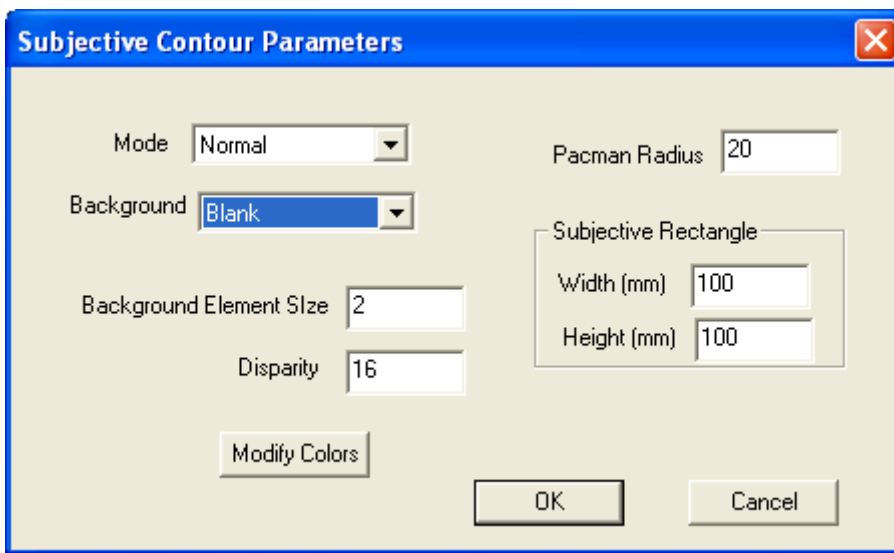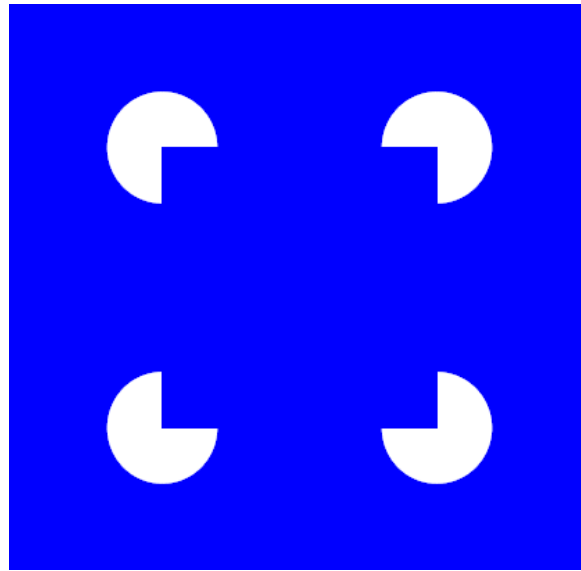
This illustrates a guiding principle behind VisionLab. The demonstrations should be more than simple objects that students can see in books; rather they should be dynamic modifiable objects so that students may experiment on them.

The following Dialog boxes and demonstrations provide additional examples.

## Muller-Lyer Illusion Properties

Mode  Normal ▾

Stereo Type  Consistent ▾

**Shaft Properties**

Length (mm)  `100`

Separation (mm)  `100.75`

Thickness (mm)  `2`

Disparity (xpixels)  `10`

**Arrow Properties**

Length (mm)  `45`

Thickness (mm)  `2`

Angle (degrees) (10 - 180)  `60`

Modify Colors

OK    Cancel

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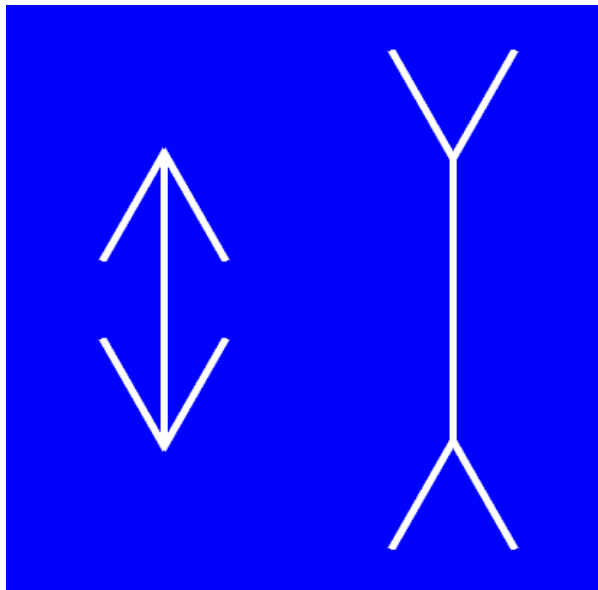


The user adjusts the shaft on the right until it appears to match the one on the left.

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## Random-Dot Stereogram Parameters

☐ Dynamic

◉ Mouse-controlled
○ Front-Back

Modify Colors

**Disparity**

Background (xpixels)  `-2`

Object (xpixels)  `16`

**Size**

Object (mm)  `75`

Element Width (mm)  `1`

Element Height (mm)  `1`

OK    Cancel
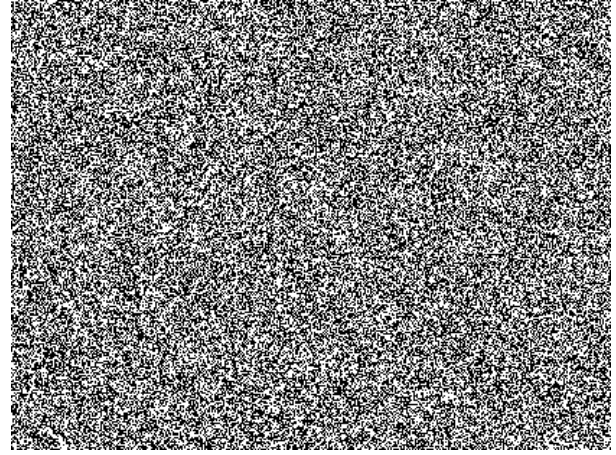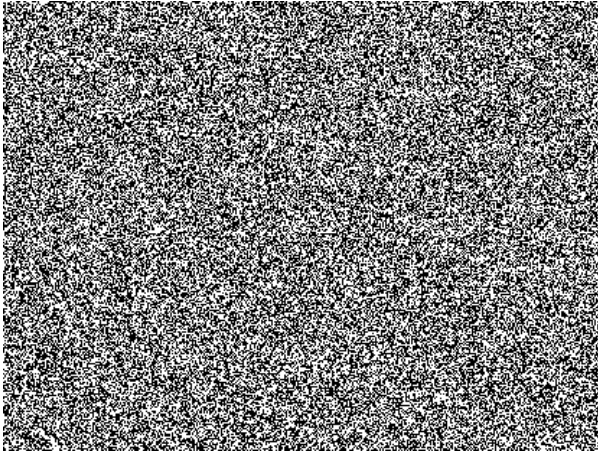
When viewed stereoscopically, a center square appears to float above the background.
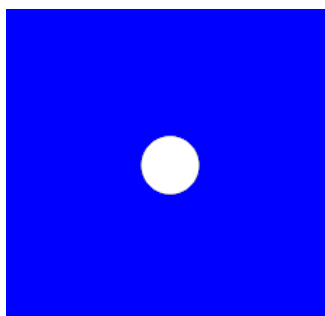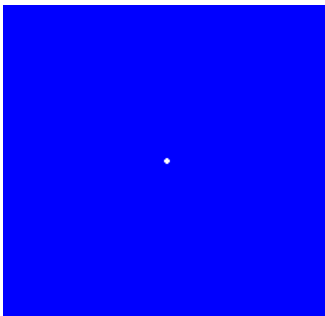




When viewed in sequence with the proper temporal parameters, the circle in the middle is not seen.

**Psychophysical Experiments**

The user may select from a variety of psychophysical & statistical methods to conduct experiments, collect & analyze data. The psychophysical are: methods of adjustment, constant stimuli, staircase, quest, and signal detection.

The complete list of experiments are:

- Line Length Discrimination
- Dot Detection (permits plotting of on-center, off-surround receptive fields)
- Stereo acuity
- Spatial Frequency shift after-effect
- Stereoscopic Size Constancy
- Muller-Lyer Illusion

Sample menus that illustrate the breadth and sophistication of the psychophysical methods follow:

## Line Length Discrimination: Methodmaker Main : Staircase

File  Edit  Help  Actions

| | | |
|---|---|---|
| Current Interwoven | (1 to 1) | 1 |

**STEP SIZES**

| | | |
|---|---|---|
| Type** | | additive |
| Initial Step Size** | mm | 0.02 |
| Final Step Size** | mm | 0.01 |

**REVERSALS**

| | | |
|---|---|---|
| Practice** | even integer (0-10) | 2 |
| Experimental** | even integer (2-1000) | 4 |
| Retry Trial** | | enabled |

Number of Seen or YES responses before decrease

| | | |
|---|---|---|
| Before first reversal** | number (1-5) | 1 |
| After first reversal** | number (1-5) | 1 |

Number of Not Seen or NO responses before increase

| | | |
|---|---|---|
| Before first expt reversal** | number (1-5) | 1 |
| After first expt reversal** | number (1-5) | 1 |
| Num Steps if not seen or NO** | .00-10.00) | 1.000000 |
| Num Steps if seen or YES** | (1.00-10.00) | 1.000000 |
| Max Number of Trials at Upper Limit** | | 999 |

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## Line Length Discrimination: Methodmaker Main : Quest

File  Edit  Help  Actions

| | | |
|---|---|---|
| Current Interwoven | (1 to 1) | 1 |

**QUEST PARAMETERS**

| | | |
|---|---|---|
| Type of psychometric function** | | Weibull |
| Slope of psych. func.** | from 0.1 to 20 | 3.500000 |
| Prob(mistaken key press)** | from 0 to 1 | 0.010000 |
| Which is primary** | | threshold |
| Threshold Definition** | %% correct (1 to 99) | 50.000000 |
| Epsilon** | log units (-11.416 to 3.790) | -0.909569 |
| Gamma--chance p(yes/correct)** | (0.00 to 0.98) | 0.000 |
| Jitter for placement** | +/- dB (0 to 99) | 0 |
| Statistic to be used for placement** | | mode |
| Type of prob density funtion** | | Gaussian |
| Lower limit for prior** | log units (-5 to -1) | -2.500000 |
| Upper limit for prior** | log units (1 to 5) | 2.500000 |
| SD of prior p-density function** | dB (0.1 to 99.0) | 12.000000 |
| Termination rule** | | fixed num of trial |
| Number of trials** | from 1 to 9999 | 30 |

**ADDITIONAL QUEST PARAMETERS**

| | | |
|---|---|---|
| Retry Trial | | enabled |
| Max Number of Trials at Upper Limit** | | 999 |

## Line Length Discrimination: Methodmaker Main : Signal

File   Edit   Help   Actions

```
      Current Interwoven          (1 to 1)                                    1
SIGNAL DETECTION PARAMETERS
      Stimuli Gen**                                                 [user-input ▼]
      Number of Levels**              integer (2-8)                        8
      Trials per Level**              integer (2-100)                      10
      # of Catch Trials**             integer (0-100)                      10
      Practice Trials per Level**     integer (0-10)                        0
      # of Practice Catch Trials**    integer (0-10)                        0
      Provide Feedback**                                            [No          ▼]
      Confidence Levels               integer (3-10)                        5
      Retry Trial                                                   [enabled    ▼]
SIGNAL DETECTION STIMULI VALUES (10.00 to 200.00)
      (1) [    10.00]    (2) [    10.00]    (3) [    10.00]
      (4) [    10.00]    (5) [    10.00]    (6) [    10.00]
      (7) [    10.00]    (8) [    10.00]
```

## Line Length Discrimination: Methodmaker Main : Method of constant stimuli

File   Edit   Help   Actions

```
      Current Interwoven          (1 to 1)                                    1
MOCS PARAMETERS
      Show table on-screen                                          [No Table        ▼]
      Central Offset Mode**                                         [disabled    ▼]
      Stimuli Gen**                                                 [user-input ▼]
      Number of Levels**        integer (1-200)                            7
      Trials per Level**        integer (1-1000)                          10
      Practice Trials/Lvl**     integer (0-100)                            0
      Levels Randomization Method                                   [Completely Random]
      Retry Trial                                                   [enabled    ▼]
FORCED-CHOICE PARAMETERS
      Selection of alternatives**                                   [random         ]
      Restrict Number of Consecutive Trials at Same Placement
          Status**                                                  [disabled    ▼]
MOCS STIMULI VALUES (10.00 to 200.00)
      (1) [    10.01]    (2) [    10.01]    (3) [    10.01]
      (4) [    10.01]    (5) [    10.01]    (6) [    10.01]
      (7) [    10.01]
```