Name:_____ Section:_____ Date:_____

CONCEPTUAL **Physics** **Experiment**

Perception

Is Seeing Believing?

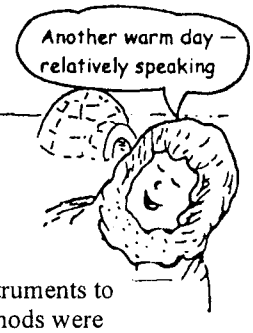
Purpose

To experience a few optical illusions and to illustrate some of the limitations of the human senses as measuring devices.

Equipment and Supplies

meterstick
rotating disks as in Figures E and F or G
pencil or pen

Discussion



Can we trust our senses? Can we rely on the human senses of sight, hearing, smell, touch and taste to make accurate observations? Methods of measurement that rely entirely upon the senses are called *subjective* methods. Hot and cold, loud and soft — are *subjective* terms. What seems cold to you may be quite enjoyable to a polar bear. What is a comfortable volume on your stereo may be much too loud to your parents. Sometimes our senses fool us. Because early science relied heavily on the use of subjective methods scientific progress was slow.

The scientific approach is a way of answering questions about nature. As the use of instruments to make measurements with greater precision increased over the centuries, subjective methods were replaced by *objective* methods. Objective methods minimize the effects of the observer on the results of an experiment. Of course, if we aren't careful, we can be fooled by our instruments, too!

Is seeing believing? In this experiment you will perceive phenomena that demonstrate the need for objective methods.

Procedure

Step 1: Observe Figure A. Do the long slanted lines *appear* to be parallel? Are they?

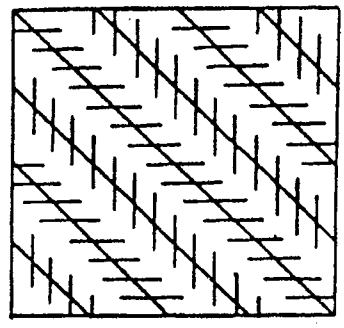


Fig. A

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Step 2: Observe the small black and white squares in Figure B. Do they appear to be the same size? Measure their sides and see.

Fig. B

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Step 3: Look at the horizontal lines in Figure C. How do their lengths compare? Measure them and see.

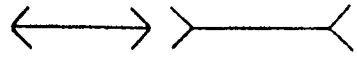

Fig. C

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Step 4: Look at the diagonal lines in Figure D. How do their lengths compare? Measure them and compare.

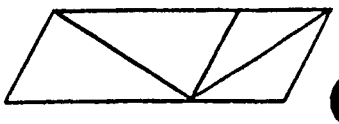

Fig. D

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Step 5: Use a pencil to spin a disk like Figure E at various speeds about 4 to 15 revolutions per second. Do you see colors? If so, which ones? Record your observations.

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Step 6: Stare at the center of the disk illustrated in Figure F for 30 seconds as you slowly spin the disk at about 2-3 revolutions per second. Then stare at the palm of your hand. Try again but stare at your surroundings after staring at the disk. What do you observe?

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Step 7: Stare at the center of the disk illustrated in Figure G for 30 seconds as you slowly spin the disk at about 2-3 revolutions per second. Then stare at the palm of your hand. Try again but stare at your surroundings after staring at the disk. What do you observe?

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Step 8: Study the people in Figure H. Which one appears tallest? Measure the people in the figure and see.

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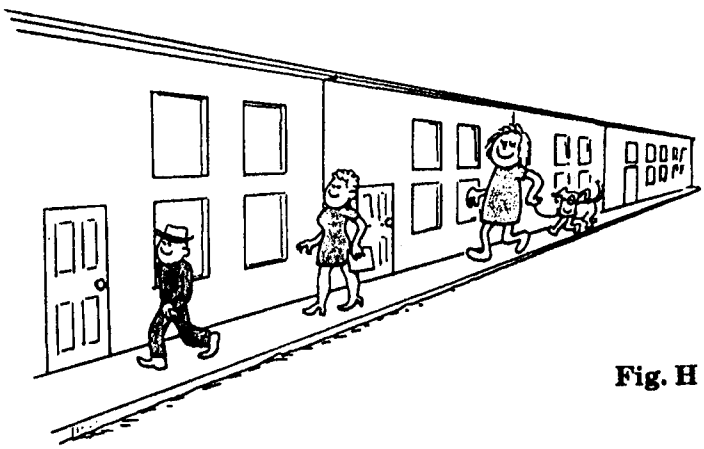


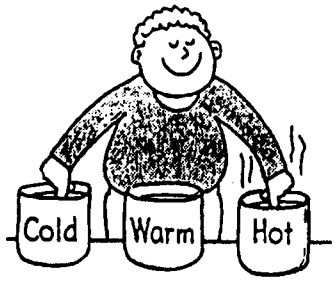
Fig. H

Step 9: Hold your hands outstretched, one twice as far from your eyes as the other, and make a casual judgment as to which hand looks bigger–the near one or the far one. Most people see them to be about the same size, while many see the nearer hand to be slightly bigger. How about you?

After you have done this and made your judgment, overlap your hands slightly and view them with one eye closed. How do they appear now?

Summing Up

What does your experience with the perceptual activities in this laboratory tell you about the reliability of human senses as measurement tools?



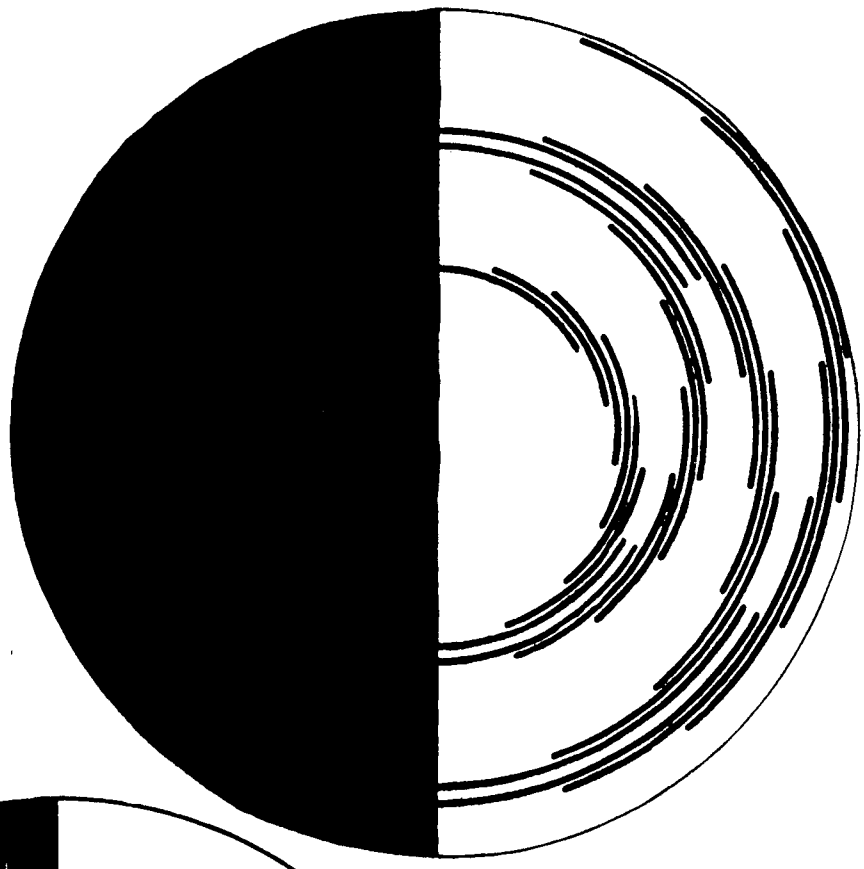
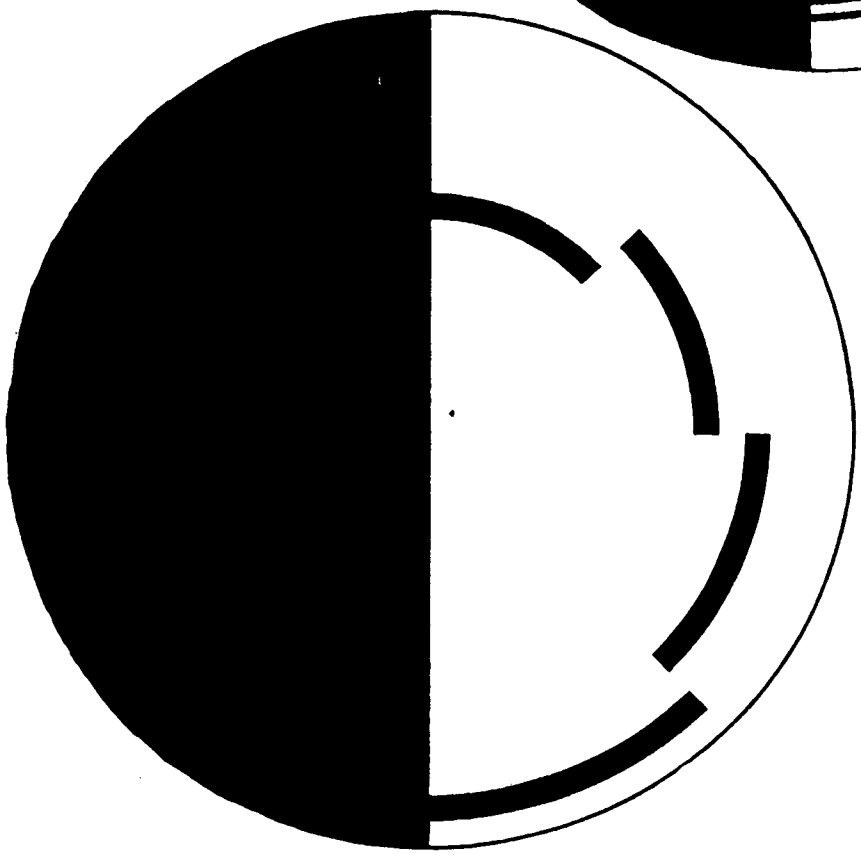


Fig. E



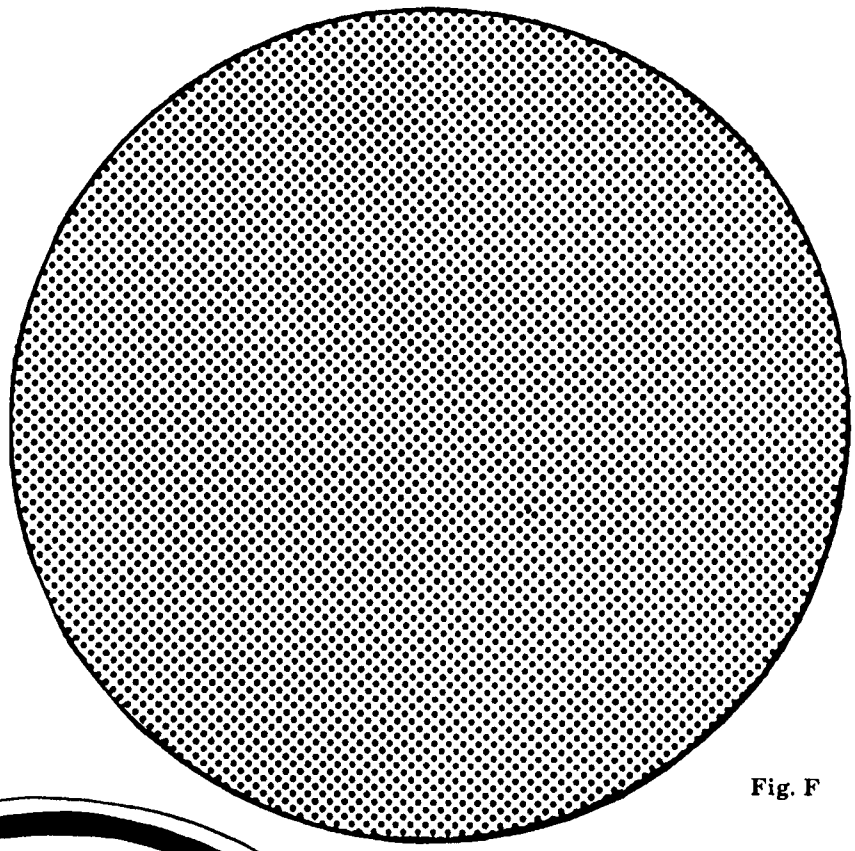


Fig. F

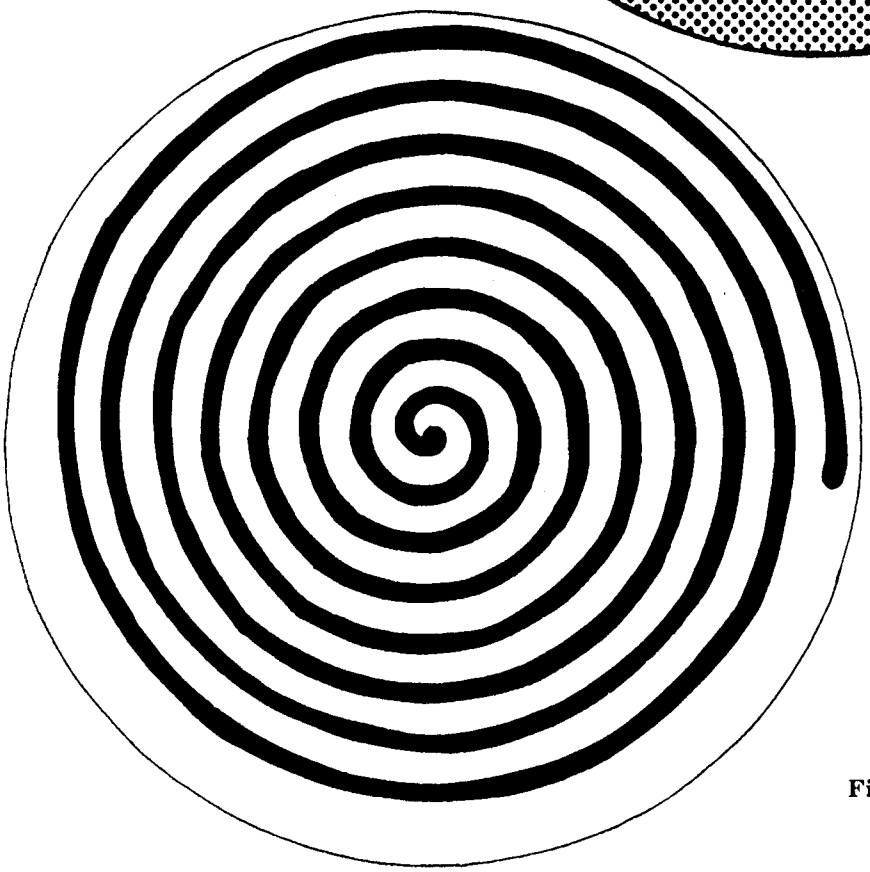


Fig. G