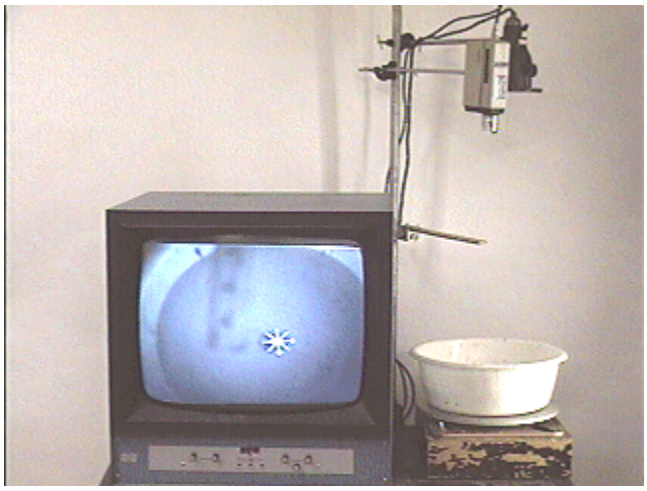
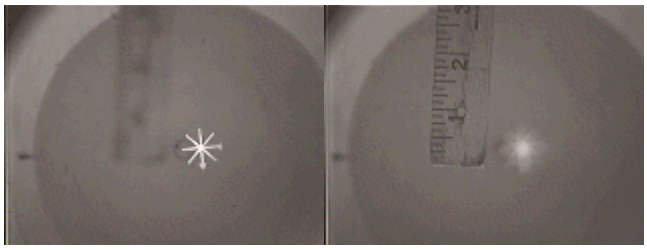
Question #211

A container of glycerine darkened by blue food coloring, seen in the photograph below, can be rotated by a beat-up record turntable at 45 RPM so that it forms a parabolic mirror. A lighted object 70 cm above the surface, in the black housing in the photograph, produces a virtual erect image 70 cm below the surface when the liquid is quiescent, because the surface acts as a plane mirror. The image can be viewed by a video camera mounted adjacent to the source object, and displayed on a large video monitor, as seen in the photograph below. A ruler positioned as seen in the photograph is out of focus as viewed by the camera because the image on which the camera is focused is 70 cm below the liquid surface.

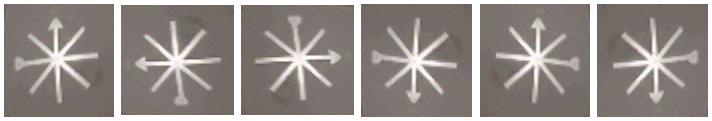


The pictures below show only what the video camera sees when it is focused on the plane mirror image of the source (at the left) and on the ruler (at the right).



Now the liquid container will be rotated at 45RPM (Remember the old 45RPM records?) so that the liquid forms a parabolic surface. The new image is located at the position of the ruler, so the image and the ruler would both be in focus in the picture at the right above.

The question this week is to predict the orientation of that image and to describe its features (real or virtual, erect or inverted, magnification less than, equal to, or greater than 1 (one). The six choices from which you may choose the possible image orieintation, as viewed by the camera, are seen below.



(a) (b) (c) (d) (e) (f)

(Incidentally, these six possible selections were formed by taking a close-up of the original photograph (f) and using a photograph processing program to create all possible permutations of that image.)

Question: If the image of the quiescent (flat) liquid surface is shown in the figure at the top of this page and as figure (f), then the image created by the rotating liquid will look like:

- (a) figure (a) above.
- (b) figure (b) above.
- (c) figure (c) above.
- (d) figure (d) above.
- (e) figure (e) above.
- (f) figure (f) above.

Click here for Answer #211 after March 7, 2005.

Question of the Week

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For questions and comments regarding the *Question of the Week* contact
Dr. Richard E. Berg by e-mail or using phone number or regular mail address
given on the Lecture-Demonstration Home Page.