# PROTOCOL

# Heart Fiber and Sheet Angles Calculation

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## Material:

Plastic rode

Dental rubber

Large and small slicer with razor blades

Superglue

Sheet of paper

## Experimental Protocol:

STEP 1: Casting

Drive the plastic rode along the long axis of the heart. The rode entry point is the thinnest zone of the apex (usually easy to feel by application of little pressure). The rode goes through the LV cavity and finally skewed the base between the non coronary cusp and the mitral valve (farley thin membrane).


Then, fill the heart with dental rubber and let it dry for 5 minutes. Soak it back in formalin

*DD Streeter, An engineering analysis of myocardial fiber orientation in pig's left ventricle in systole, 1966.*

STEP 1: Circumferential slicing

Use the lager slicer to cut a slice of the heart perpendicular to the long axis (axis of the rode). The slice thickness is ~10mm.

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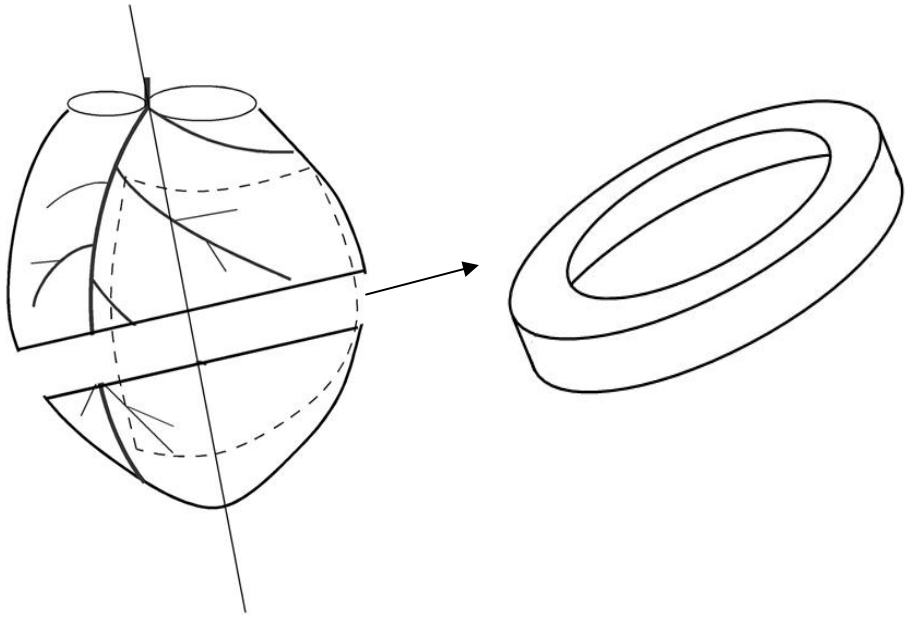
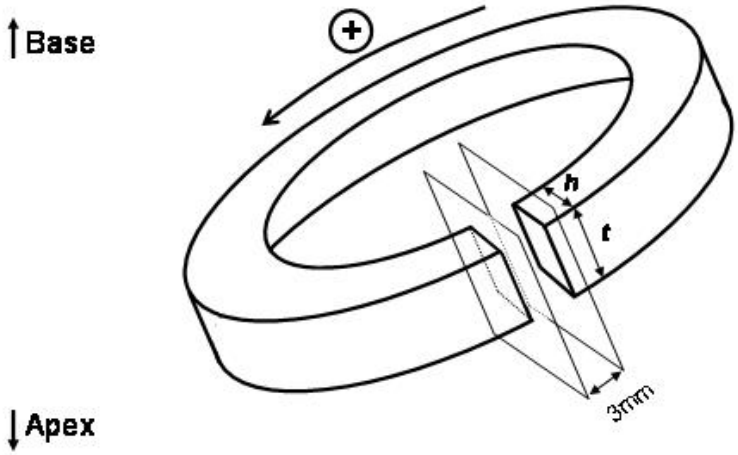


STEP 2: Longitudinal slicing

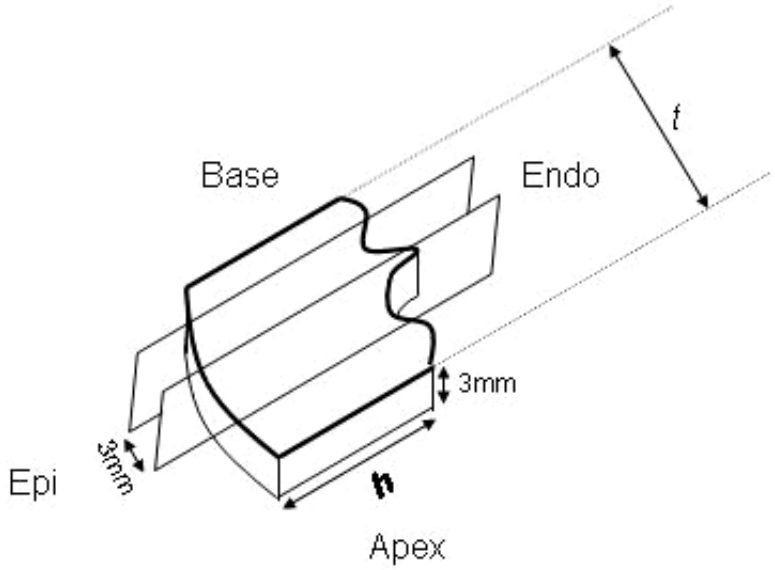
Use the slicer with parallel blades to cut a block that is *3[mm]* x *t* x *h*, where *t* is the thickness of the ring slice and *h* is the wall thickness. Keep track of the apex face, base face, and positive circumferential direction.




The blades should be perpendicular to the epicardium surface. The circumferential direction is counter-clockwise if, and only if, the base is out of the page and the apex is into the page.

STEP 3: Circumferential second cut

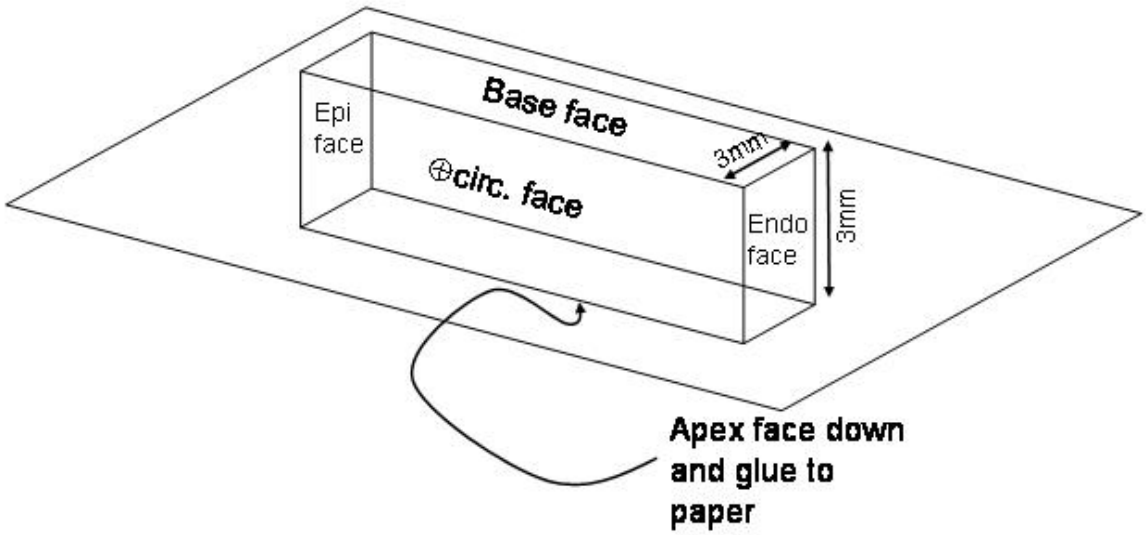
Lay the block on its side, ⊕ circ. face laying upward. Use the parallel blades to cut a block that is *3* x *3* x *h*. Keep track of apex face, etc.




The blades should be perpendicular to the epicardium surface.

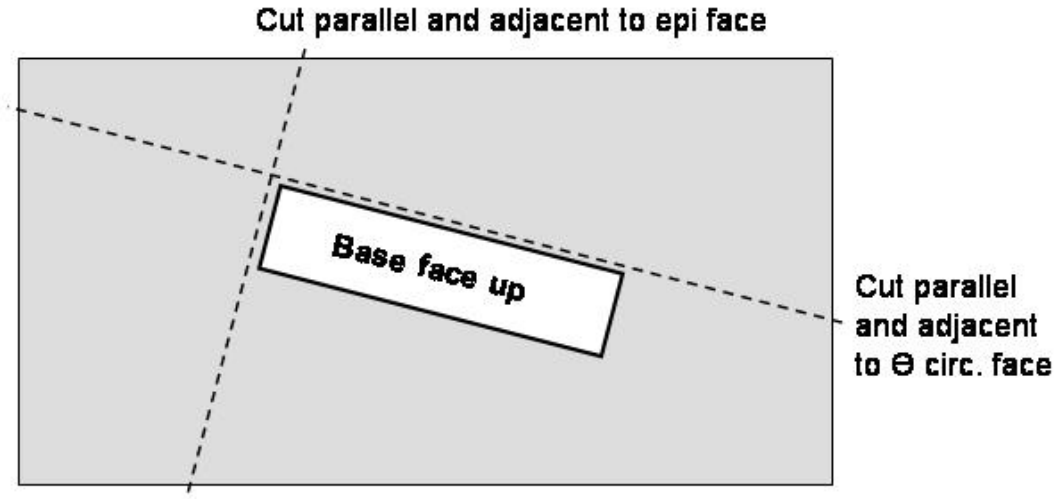
STEP 4: Glue

Glue (with superglue, i.e. cyanoacrylate) the block to a piece of paper with the apex face down.



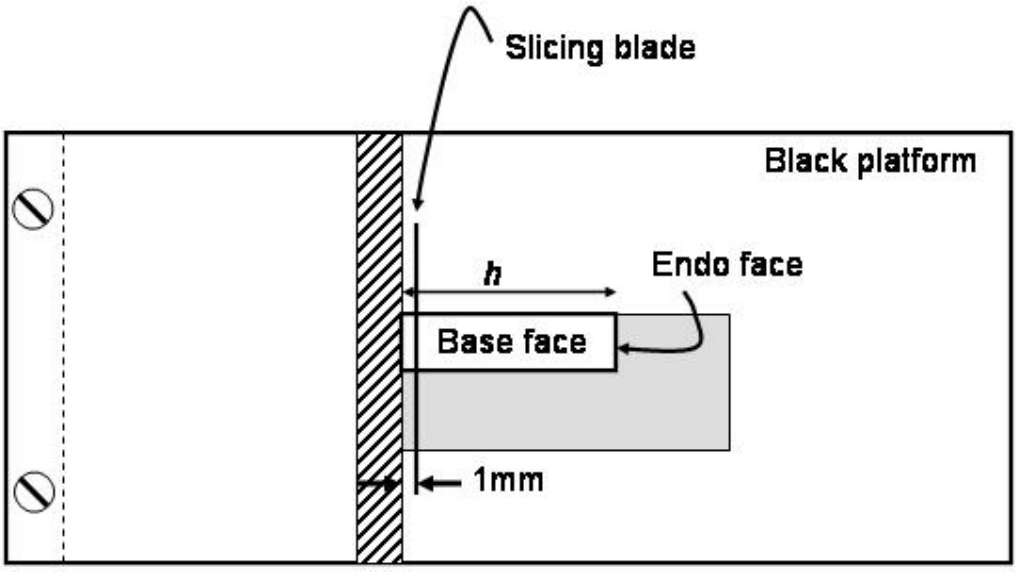
STEP 5: Paper cut

Cut the paper close to the block as illustrated under. **Measure** the wall thickness, ***h***, and write it down, or/and take a picture of the block with a scale in view.



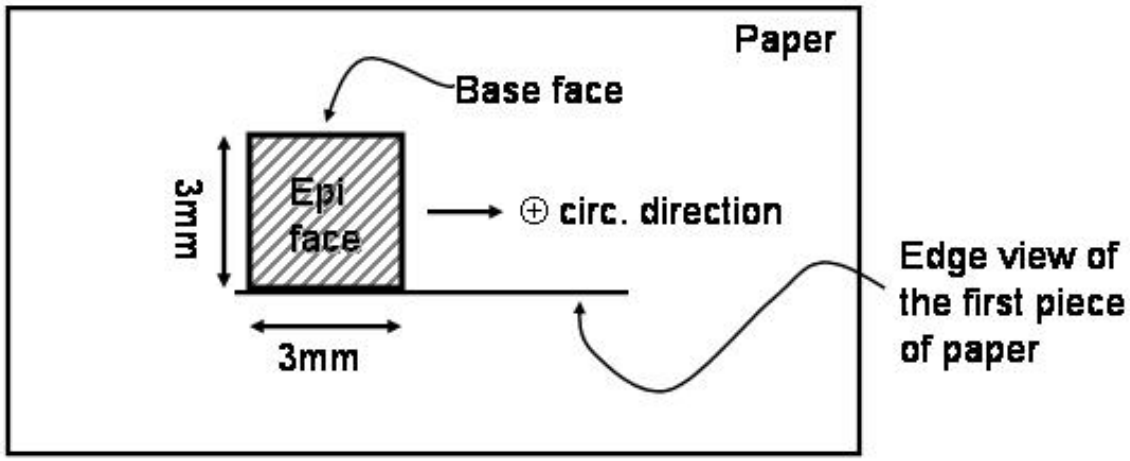

STEP 6: Slicing

Use the black plastic platform for the slicer and push the epi face up against the block. Make sure that the paper is flat against the platform; then slice with the single blade slicer. Measure the length of block, *h*, that is leftover.



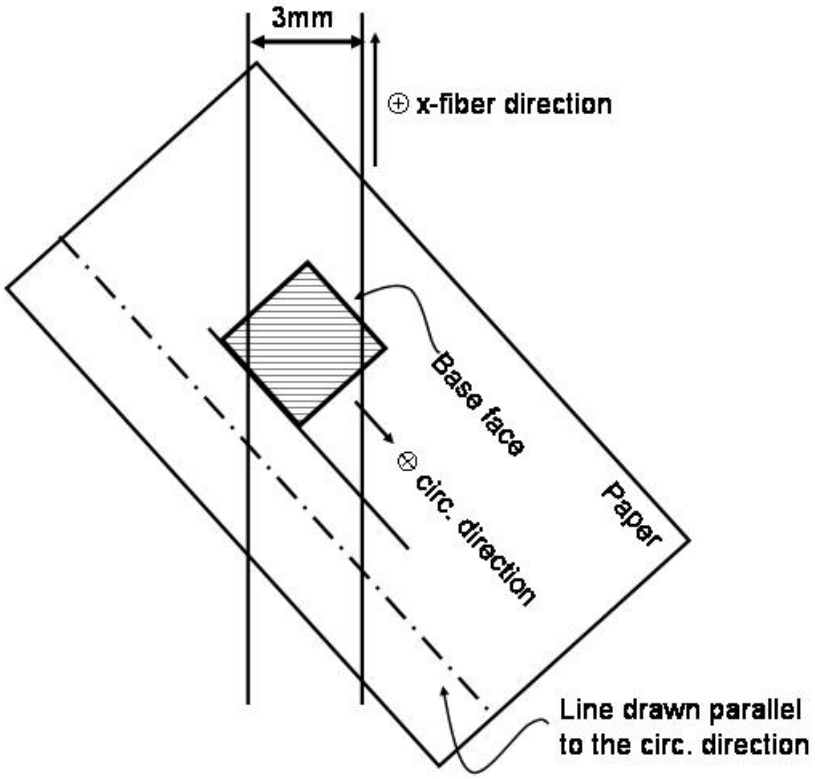
STEP 7:

Glue the 1mm thick slice to a piece of paper with the epi face upward.

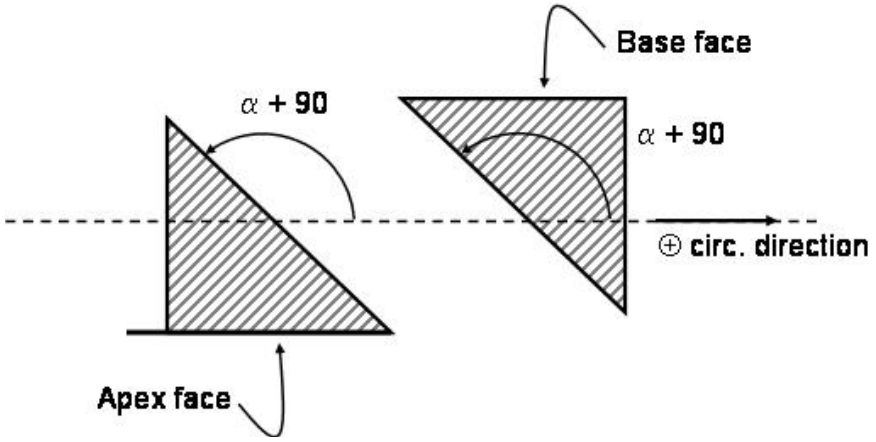



STEP 8: Fiber angle measurement

Draw a line parallel to the ⊕ circ. direction offset bellow the block. Then view fiber direction in dissection scope and align parallel blades slicer so that it cuts perpendicular to the fiber direction. Keep track of ⊕ x-fiber direction.

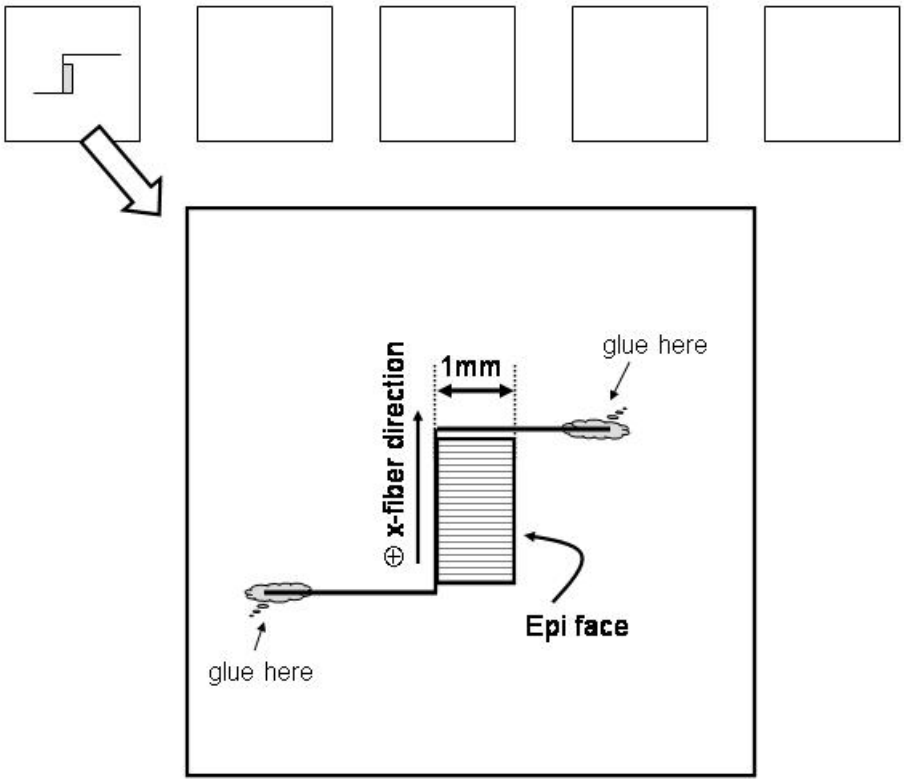


On the triangular left over pieces label the ⊕ circ. direction. Use the piece with the longest circ line to measure the fiber angle, α.




STEP 9: Final glue

Use the square forms to draw a grid on a piece of paper and glue the 1mm thick slice with the fiber direction facing upward and with the paper ends bent as illustrated.



STEP 10:

Repeat 5-8 until you reach the endocardium. The last few slices will likely be unusable.

STEP 11:

Glue the square form so as to enclose all of the slices. Infiltrate in JB-4 solution Aplus catalyst for a few days to a week (read the JB-4 instructions). The form can be placed in a ziplock bag for infiltration.