

# Stochastic Analysis of Human Trabecular Bone from Different Anatomic Locations

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## Goals

My goals this semester are to statistically analyze a total of 12 femoral neck samples, 6 healthy samples and 6 osteoporotic samples for comparison.

## Description

I have obtained statistical results using the program JMP 9.0 for an 8mmx20mm cylindrical femoral neck sample which was image processed by Columbia University. This data will include the key microarchitectural features of trabecular bone, rods and plates, which was lost in the previous analysis I had performed. I have analyzed the distributions for the orientation of plates and rods on the X, Y, Z axes, plate thickness, and rod diameter thus far.

The number of plates found in the 8mmx20mm cylindrical vertebrae sample was found to be 5846 plates. The distribution for the orientation of plates in the X, Y, and Z axes all follow a normal 3 mixture with means  $51.1 \pm 23.8$  degrees (standard error= 0.3),  $53.7 \pm 23.0$  degrees (standard error= 0.3), and  $71.24 \pm 19.3$  degrees (standard error= 0.25), respectively (See figures 1-3). The plate thickness distribution was found to follow a gamma distribution with mean  $3.3 \pm 1.3$ mm (standard error=0.02) (See figure 7).

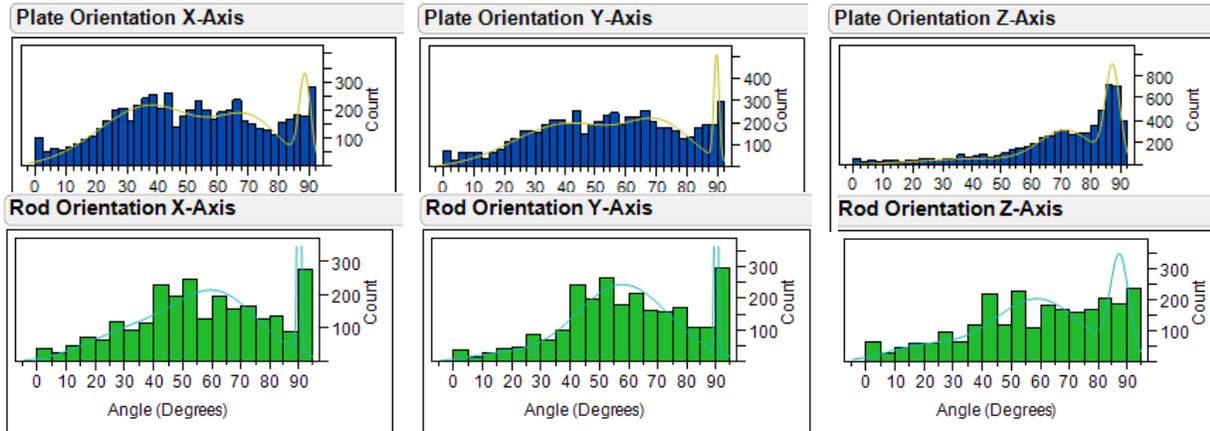
The number of rods found in the sample was found to be 2429 rods. The distribution for the orientation of rods in the X, Y, and Z axes all follow a normal 3 mixture with means  $56.8 \pm 22.6$  (standard error=0.5),  $59.5 \pm 21.1$  (standard error=0.4), and  $59.2 \pm 23.7$  (standard error=0.5), respectively (See figures 4-6). A Johnson Su distribution was found to best fit the data for rod diameter with mean  $2.89 \pm 1.3$  (standard error=0.03) (See figure 8).

## Heights of Achievements throughout the Semester

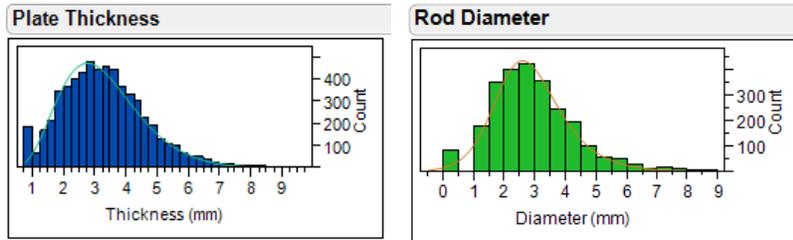
- Presented research at the Orthopedic Research Society Annual Meeting in San Antonio, TX
- Began collaborating with Columbia University
- Obtained data from a femoral neck sample for analysis from Columbia University
- Obtained data for rods and plates which was lost during previous analysis

- Obtained results for Plate Orientation, Rod Orientation, Plate thickness, and Rod Diameter for the femoral neck sample

**Figures 1-3: Distributions for Plate Orientation in the X, Y, Z axes**



**Figures 4-6: Distributions for Rod Orientation in the X, Y, Z axes**



**Figures 7-8: Distributions for Rod Orientation in the X, Y, Z axes**