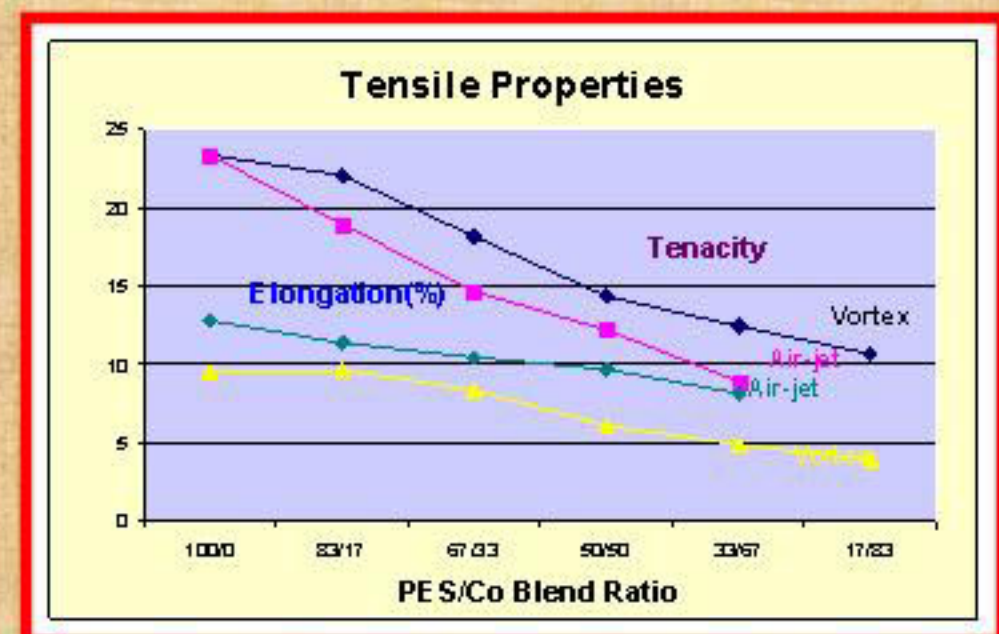
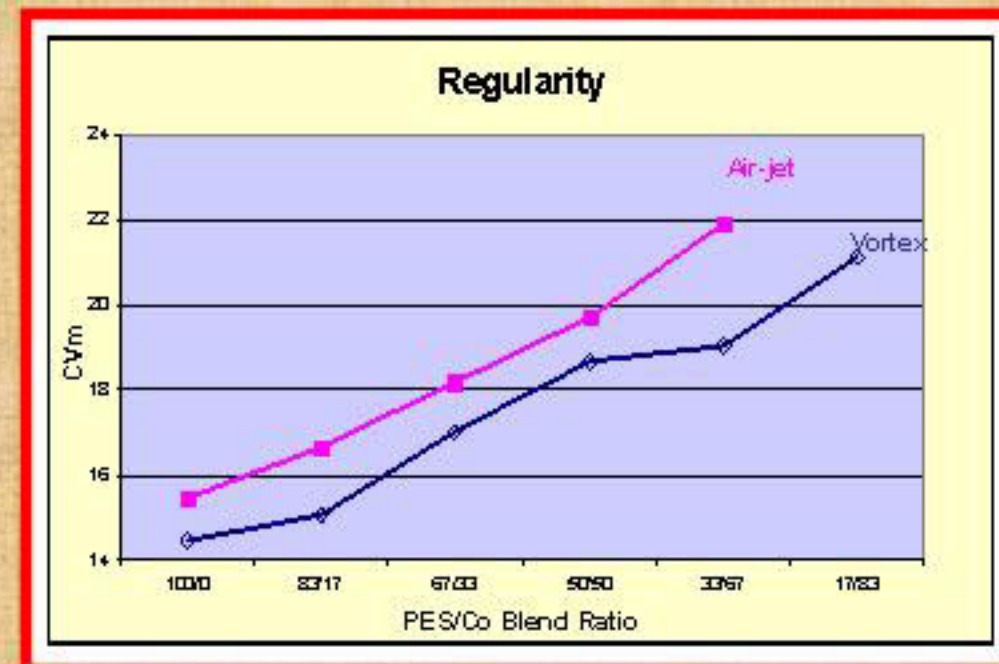
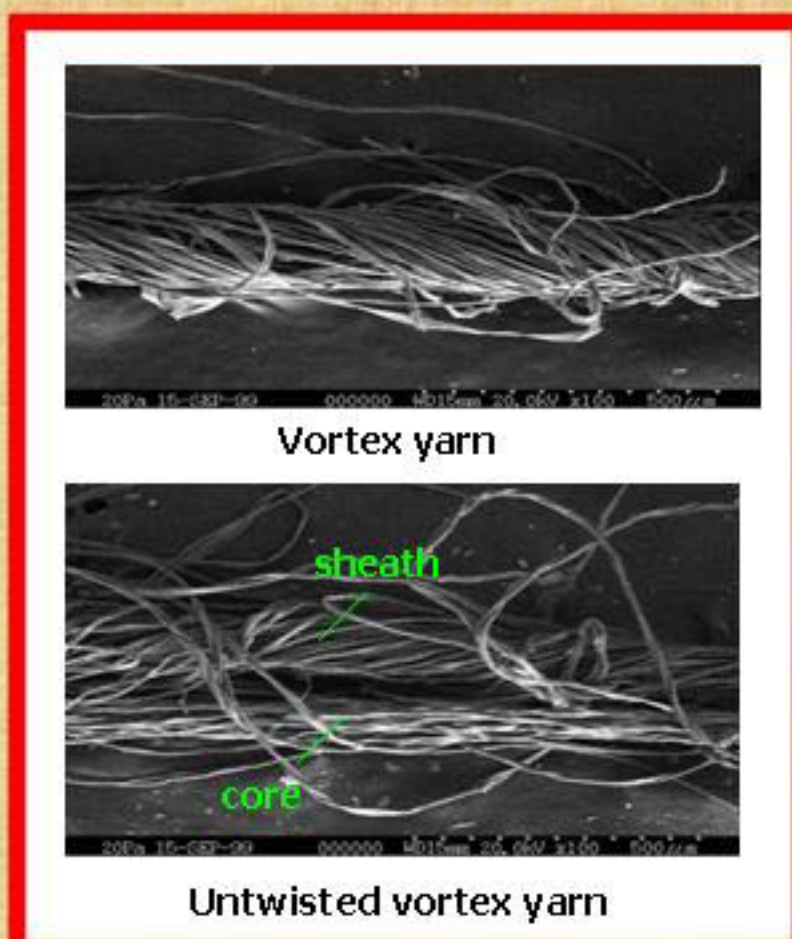


# Structure and Properties of Vortex and Compact Spun Yarns

Guldemet Basal

## Vortex Spinning vs. Air-jet Spinning

### Vortex Yarn Structure



### Vortex vs. Air-jet spun yarn



Vortex yarn has higher number of wrappings and more ring-like appearance.

## Compact Spinning vs. Conventional Ring Spinning

### Objectives

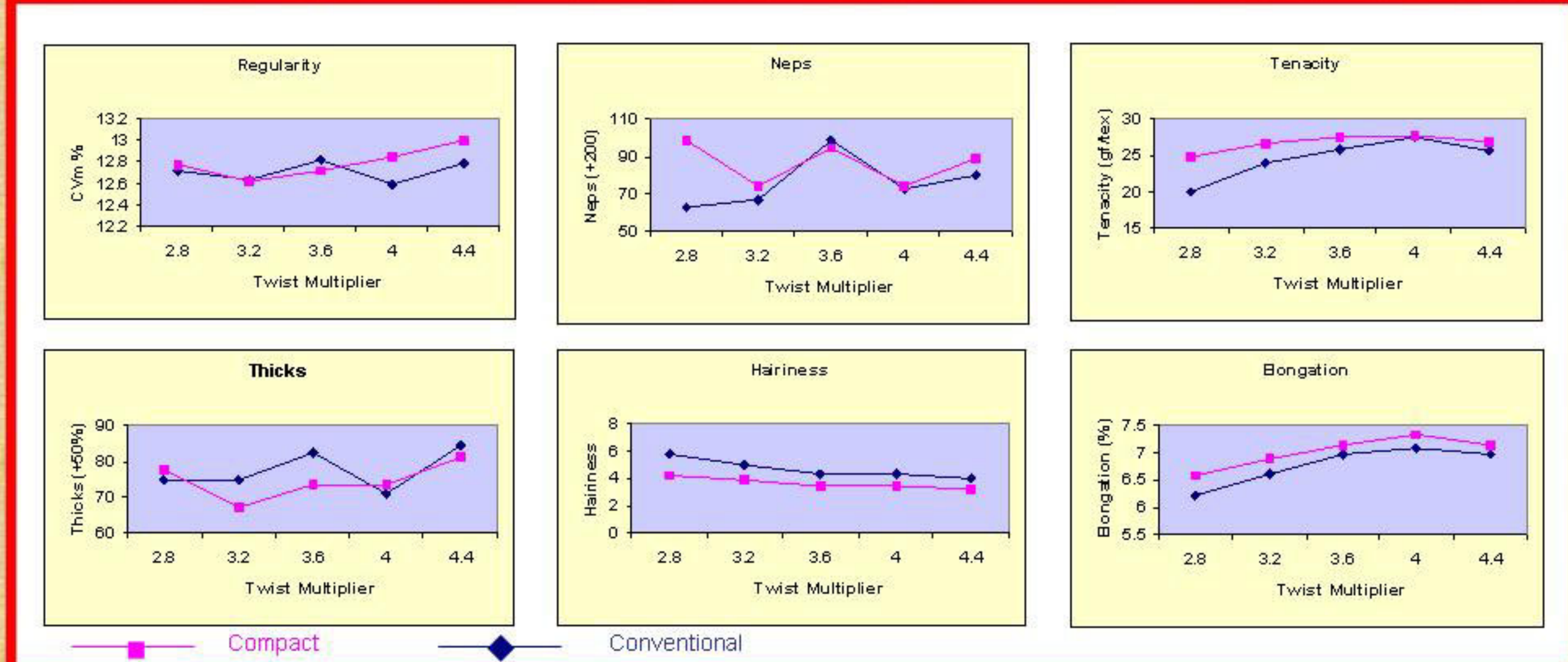
#### Ring Spinning

Tension differences among fibers (spinning triangle)  
↓  
Migration  
↓  
Strength

#### Compact Spinning

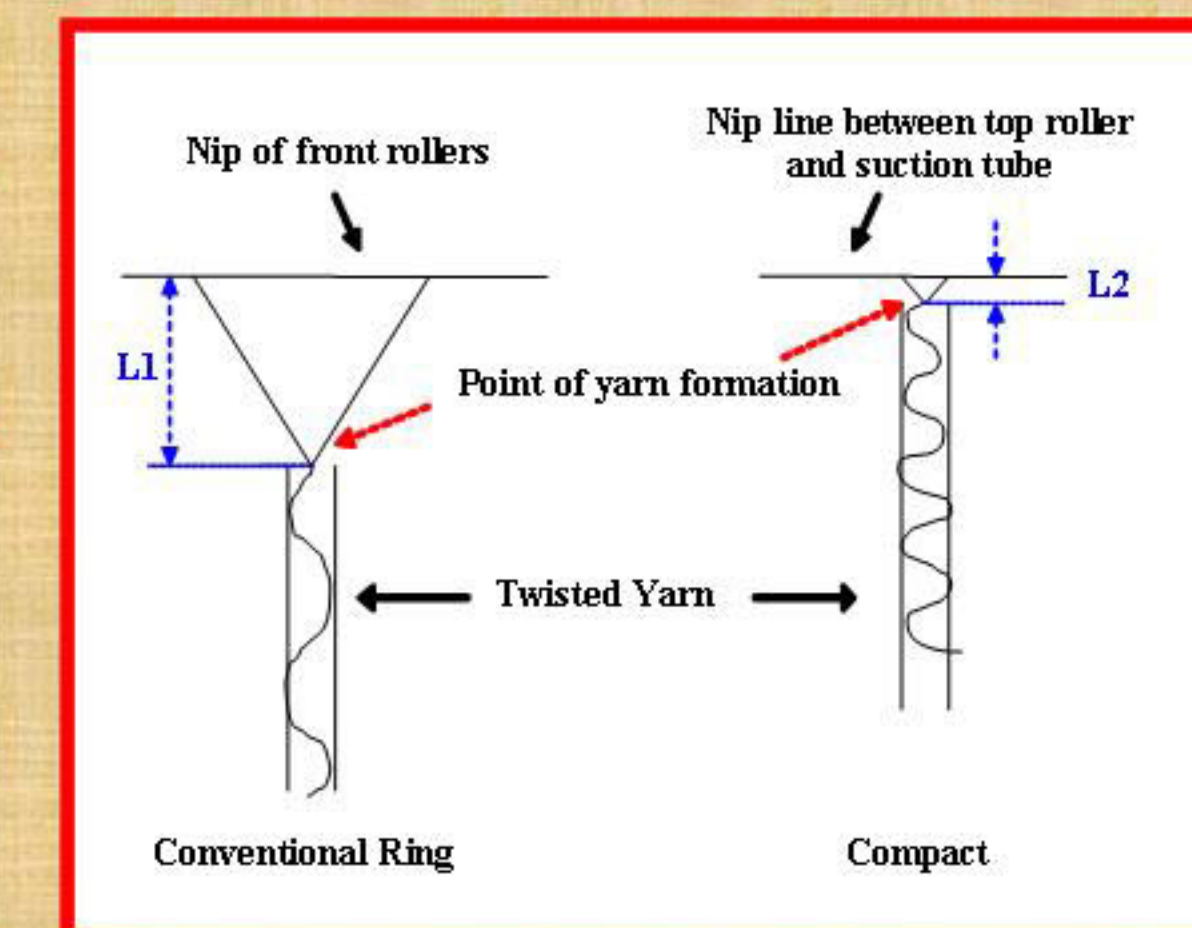
Minimized spinning triangle  
↓  
Stronger yarns ???

### Effects of Twist and Spinning Technology on Yarn Properties



### Effects of Twist and Spinning Technology on Yarn Structure

Parameter	Compact	Conventional
Twist	↑	↓
Mean migration intensity	↑	↓
Yarn diameter	↓	↑
Mean migration intensity	Compact > Conventional	
Amplitude of migration	Compact > Conventional	
Yarn diameter	Compact < Conventional	



Due to minimized spinning triangle a very short length of the fiber rapidly becomes stressed. This causes a quick rate of change of fiber radial position (see figure on the left).

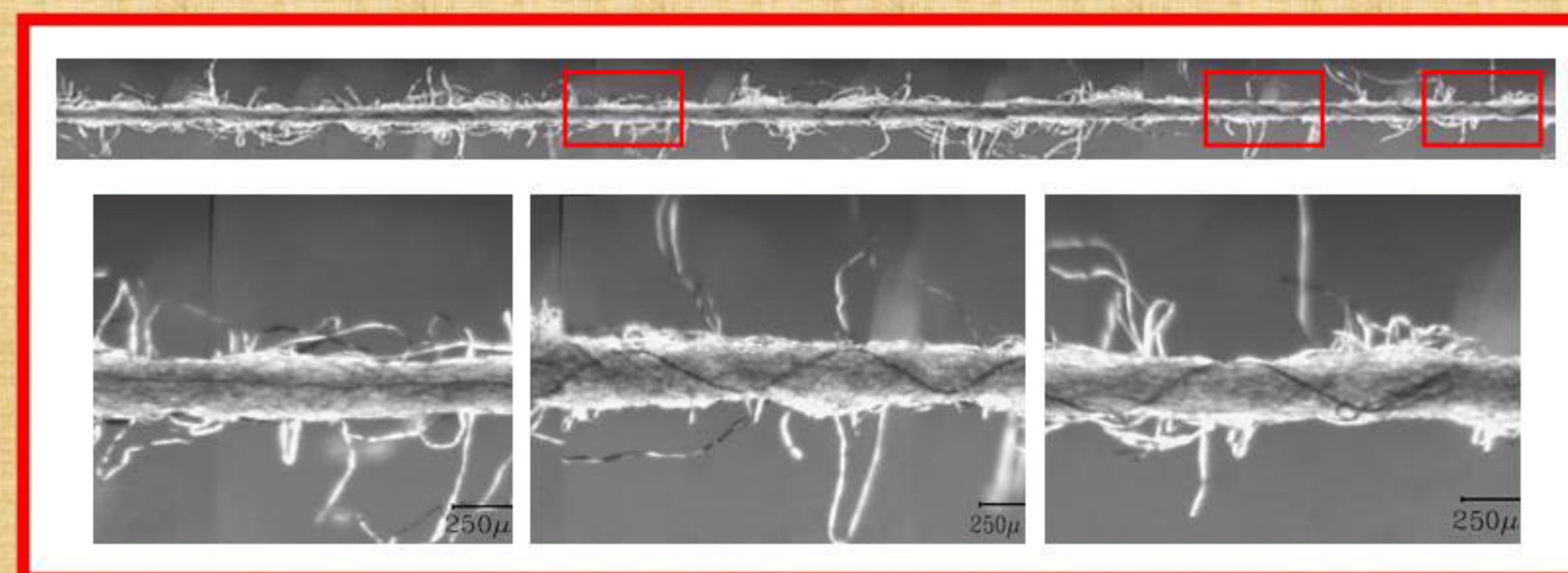
## Structure and Properties of Vortex Yarns

### Objectives

How process parameters affect yarn structure, and in turn, yarn properties?

### Methodology

Tracer fiber technique  
+  
Image Analysis Application Version 3.0  
↓  
Spin Panorama 2.0  
↓  
Adobe Photoshop 6.0  
↓  
Matlab 6.1



### Fiber Configuration in Vortex Yarns

Fibers first show core fiber characteristic, lying parallel to the yarn axis then wrapper fiber characteristic, being helically wound onto the core.

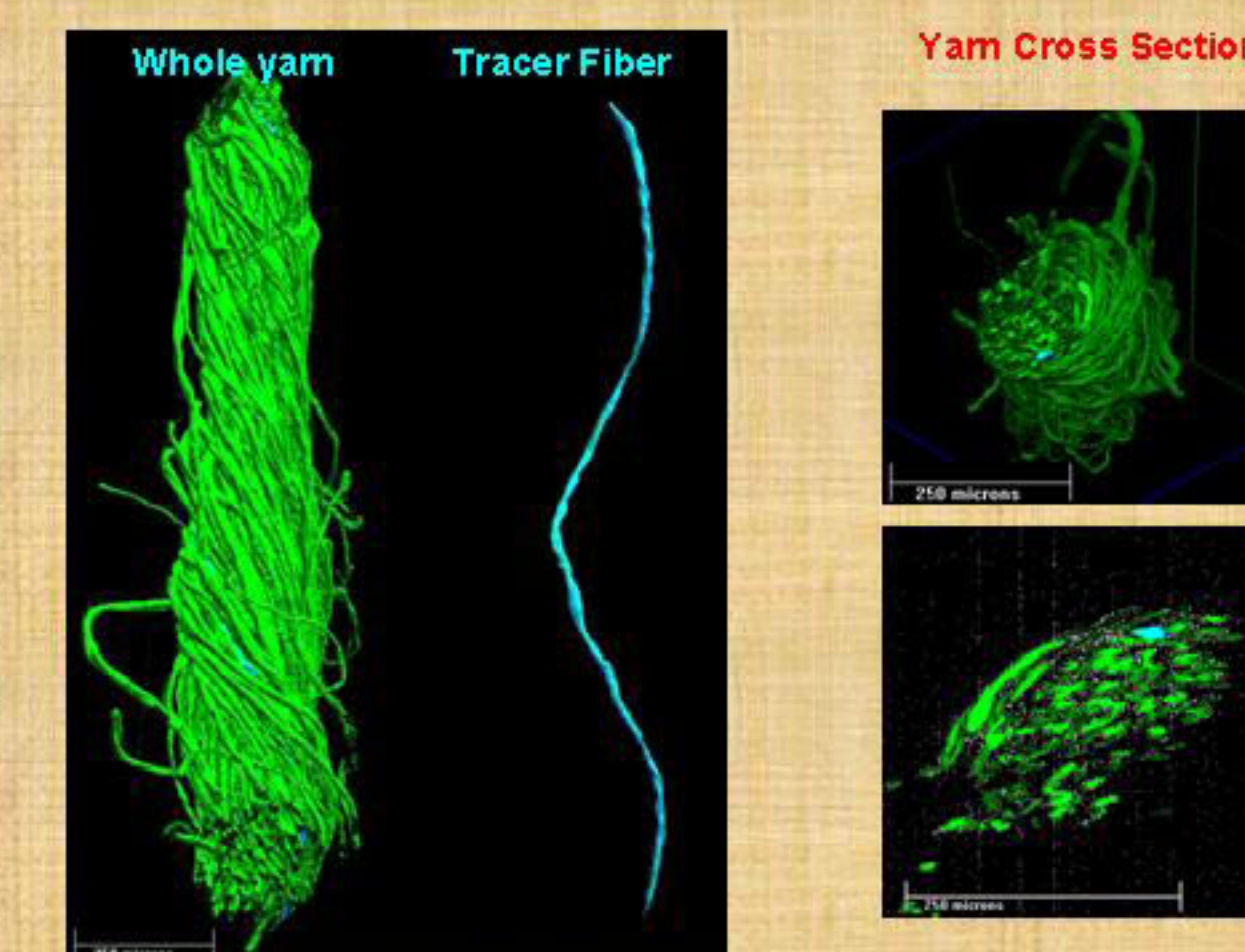
### Effects of Process Parameters on the Structure and Properties of Vortex Yarns



## DVI Technology for Yarn Structural Analysis

### Objectives

Is the Digital Volumetric Imaging (DVI) technology a viable technique to examine yarn structure?



### Conclusion

The DVI technology is very accurate and fast. It could replace the traditional tracer fiber method. Some limitations of this technology at present are the sample size and cost.

DVI creates a 3D replica of a sample by combining the data generated from the sequenced 2D images of sections obtained through the surface imaging microscopy. 3D model of the yarn can be sorted through section by section (in the x, y, and z planes) and coordinates of the tracer fiber can be obtained for each section.

Under the direction of Dr. William Oxenham