Fiber Classification — *Synthetic Fibers*

- 50% of fabrics are artificially produced
- Made by connecting monomers to form polymers
- Examples:
  - Rayon
  - Acetate
  - Nylon
  - Acrylic
  - Polyester
Fiber Classification
– Synthetic Cellulose Fibers

Regenerated Fibers (derived from cellulose):

- **Rayon**
  - Most common in this group
  - Imitates natural fibers, but stronger

- **Celenese®**
  - Cellulose chemically combined with acetate
  - Found in many carpets

- **Polyamide nylon**
  - Cellulose combined with three acetate units
  - Breathable and lightweight
  - Used in performance clothing
Fiber Classification
– *Synthetic Polymer Fibers*

**Synthetic Polymer Fibers**
- Petroleum base
- Very different from other fibers
- Fibers are spun together into yarns
- No internal structures
- Uniform diameters
Fiber Classification
– *Synthetic Polymer Fibers*

- **Polyester**
  - “Polar fleece”
  - Wrinkle-resistant
  - Not easily broken down by light or concentrated acid
  - Added to natural fibers for strength

- **Nylon**
  - Easily broken down by light and concentrated acid
  - Otherwise similar to polyester
Fiber Classification
—Synthetic Polymer Fibers

- Acrylic
  - Inexpensive
  - Tends to “ball” easily
  - Substitute for artificial wool or fur

- Olefins
  - High performance clothing
  - Quick drying
  - Resistant to wear
Natural and Synthetic Fibers
Comparison of Natural and Synthetic Fibers

- Synthetic fibers are stronger than natural fibers
- Synthetic fibers are not damaged by microorganisms
- Synthetic deteriorate in bright light
- Synthetic melt at lower temperature
Comparison of Natural and Synthetic Fibers

Visual Diagnostics of Some Common Textile Fibers under Magnification

<table>
<thead>
<tr>
<th>Cotton</th>
<th>Flax</th>
<th>Silk</th>
<th>Wool</th>
<th>Synthetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flattened hose appearance</td>
<td>“bamboo stick” appearance</td>
<td>do not taper, yet exhibit small variations in diameter</td>
<td>surface scales may be visible</td>
<td>vary widely in cross-sectional shape and diameter</td>
</tr>
<tr>
<td>Up to 2 inches long tapering to a blunt end</td>
<td>straight with angles but not very curved</td>
<td>may be paired (raw silk) with another fiber</td>
<td>hollow or partial hollow core</td>
<td>generally straight to gentle curves</td>
</tr>
<tr>
<td>may have a frayed “root”</td>
<td>“nodes” are visible every inch or so</td>
<td>no internal structure</td>
<td>fibers up to 3 inches long tapering to a fine point</td>
<td>uniform in diameter</td>
</tr>
<tr>
<td>hollow core not always visible</td>
<td>often occur in bundles of several fibers</td>
<td></td>
<td></td>
<td>may have surface treatment that appears as spots, stains, or pits</td>
</tr>
</tbody>
</table>