



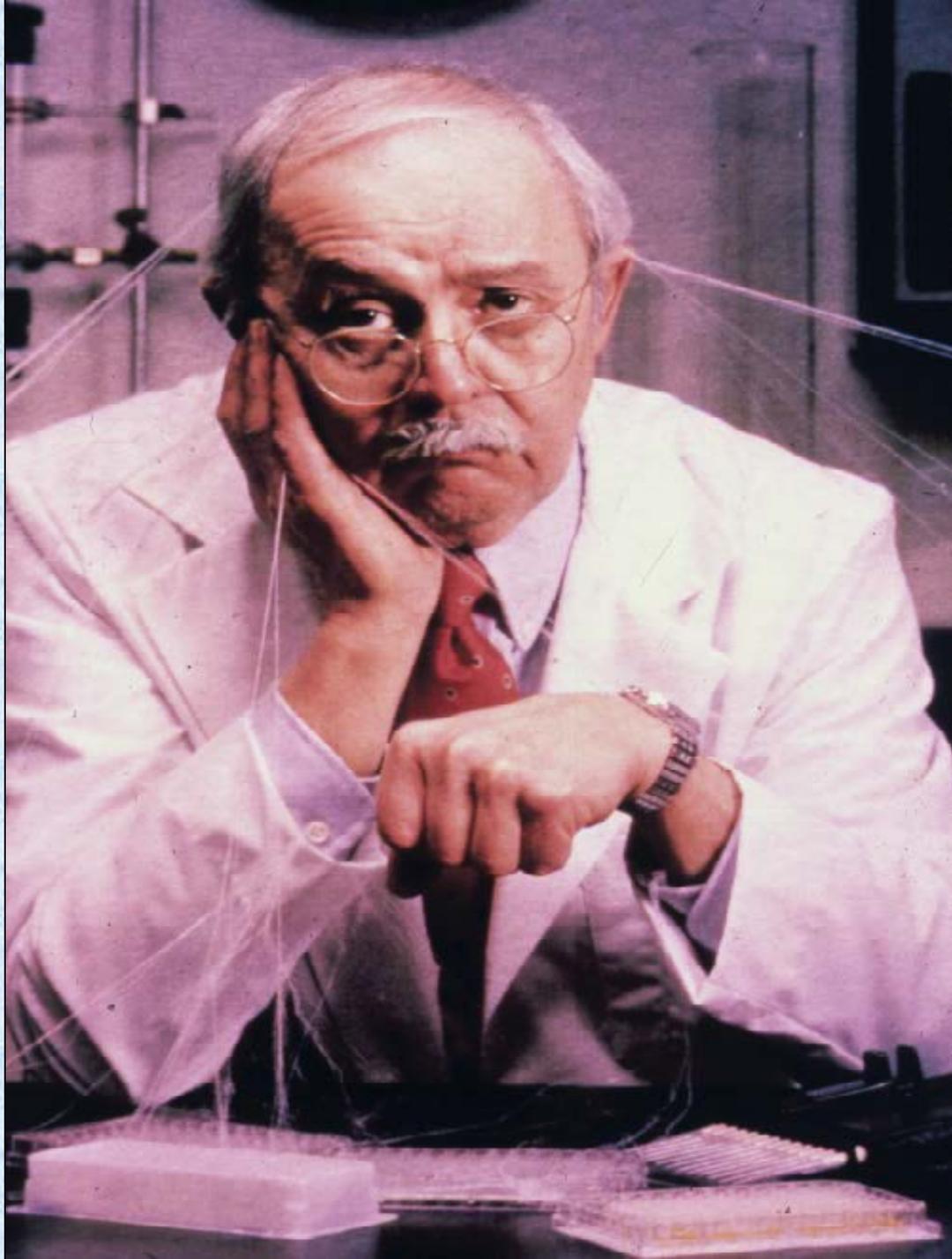
# **Mold And Stain Control**

# Is It More Difficult Now?

- Absolutely until recently
- Global warming (only kidding)
- Slow markets/Long storage times
- Buyers market/public perception
- Everyone has this problem
- Universal Response- blame chemical
- Blame congress/the prez: Why not? We blame them for everything else

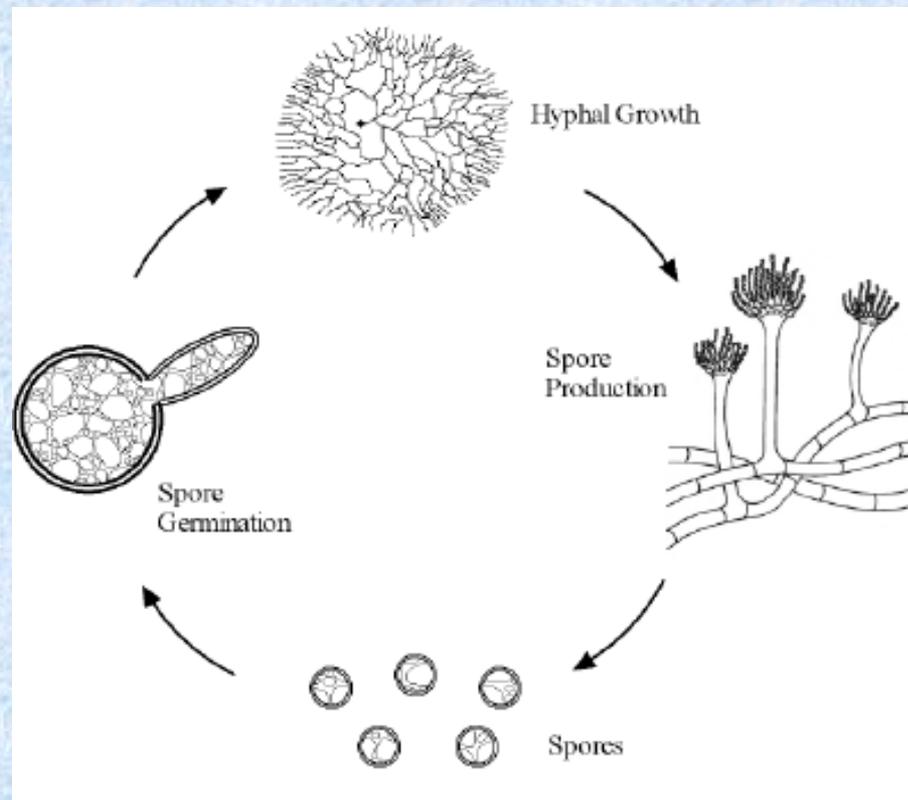
# Outline

- Fungi in general
- Time in the woods
- Log decks
- Post- sawing
- Chemical capabilities



# **A Fungal Primer**

# Mold Life cycle

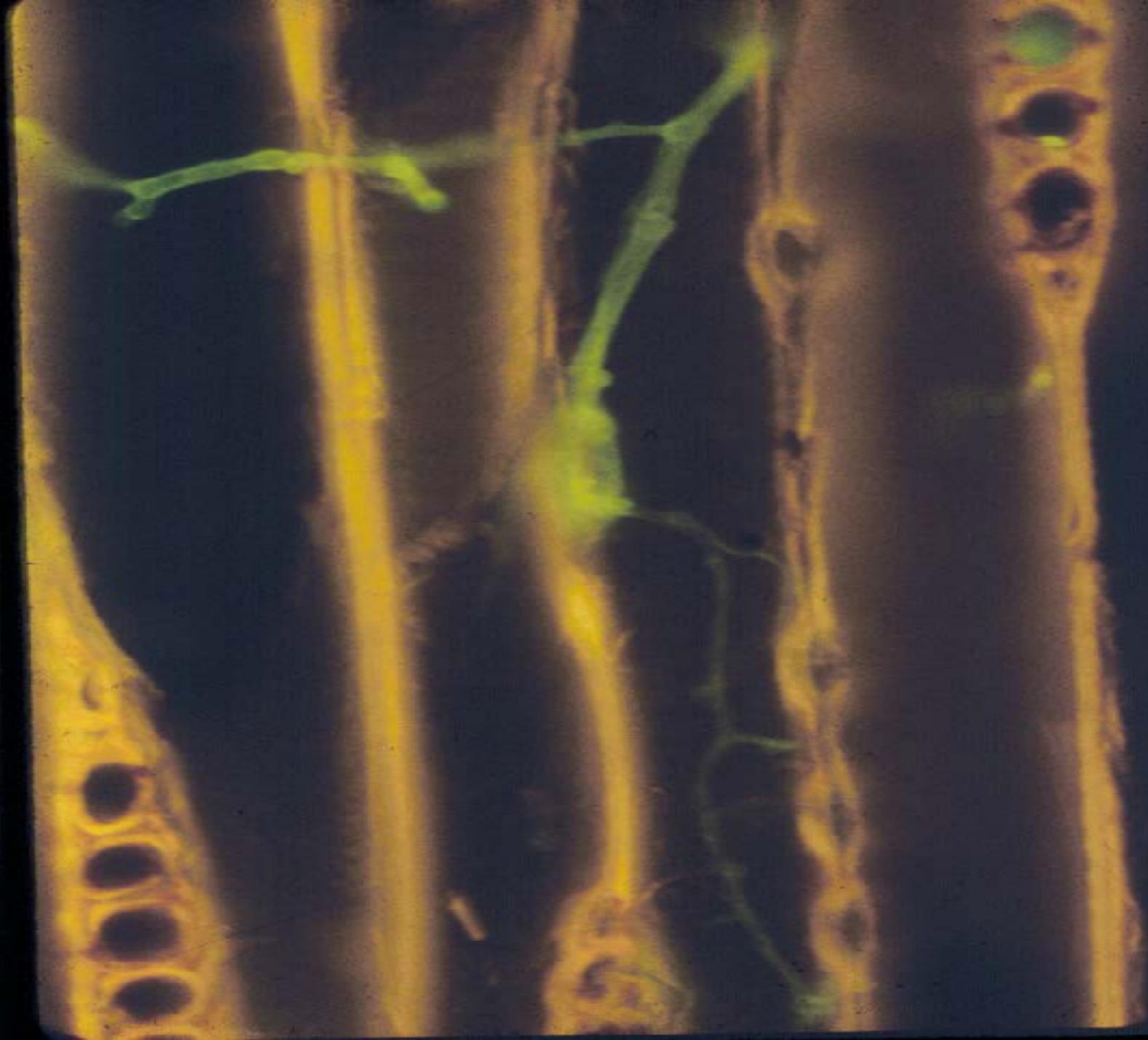


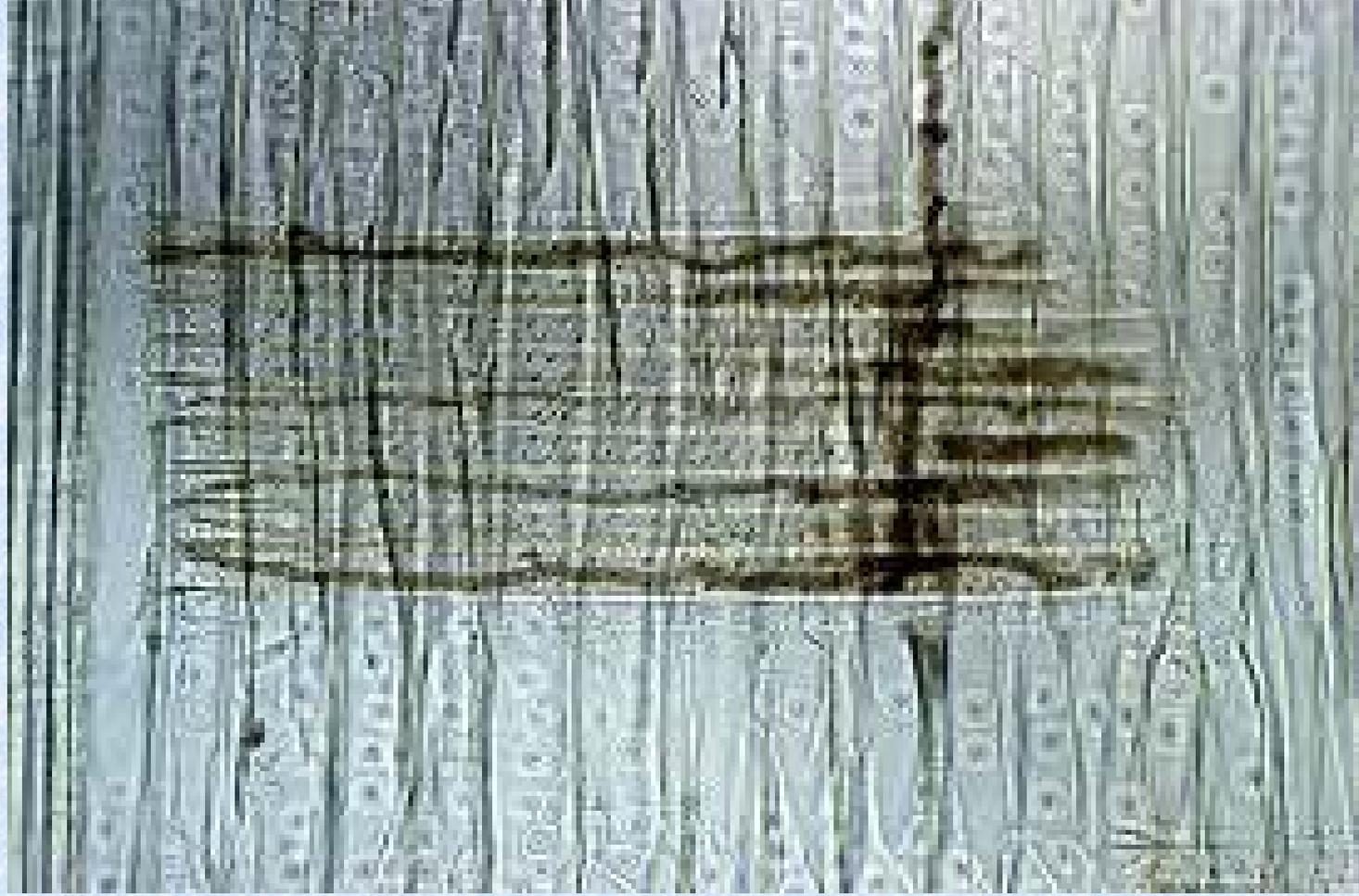
# Fungi

Fungal Type	Effect on Wood
Molds	Use sugars, increase permeability, pigmented spores on surface
Stain	Use sugars, increase permeability, stain wood
Decay	Use structural polymers, increase permeability, weaken wood

# Mold vs Stain

- Surface vs internal stain
- Species less important
- Both fungi grow in sapwood
- Removing surface fungus does not kill fungus inside





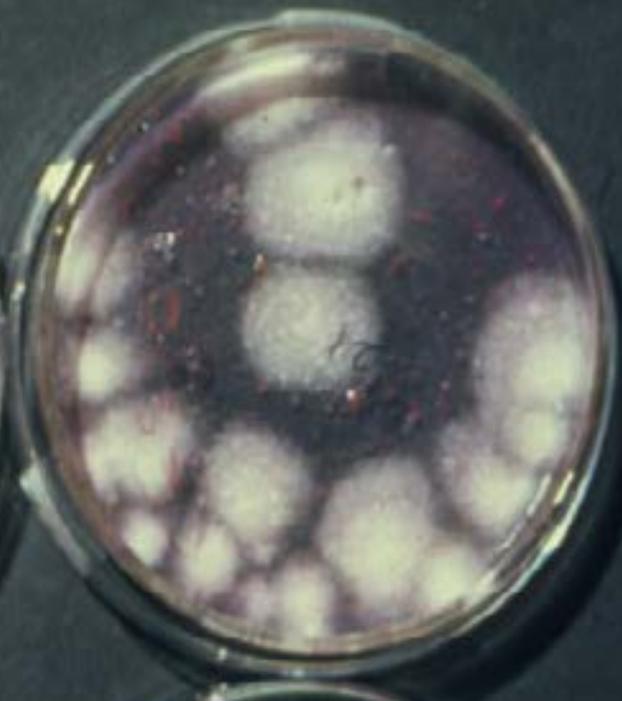
# Requirements for Growth

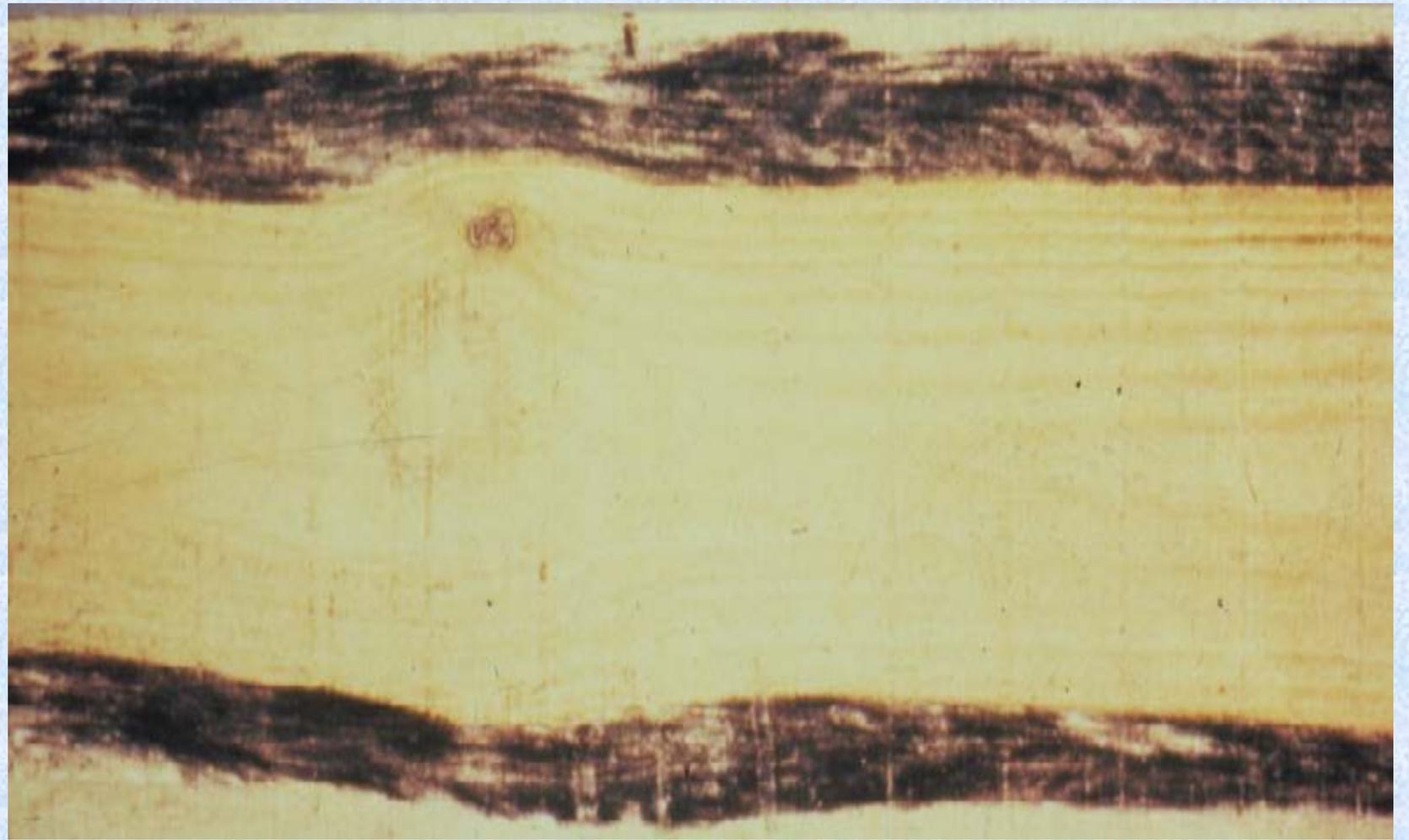
 Oxygen

 Temperature

 Water

 Nutrients



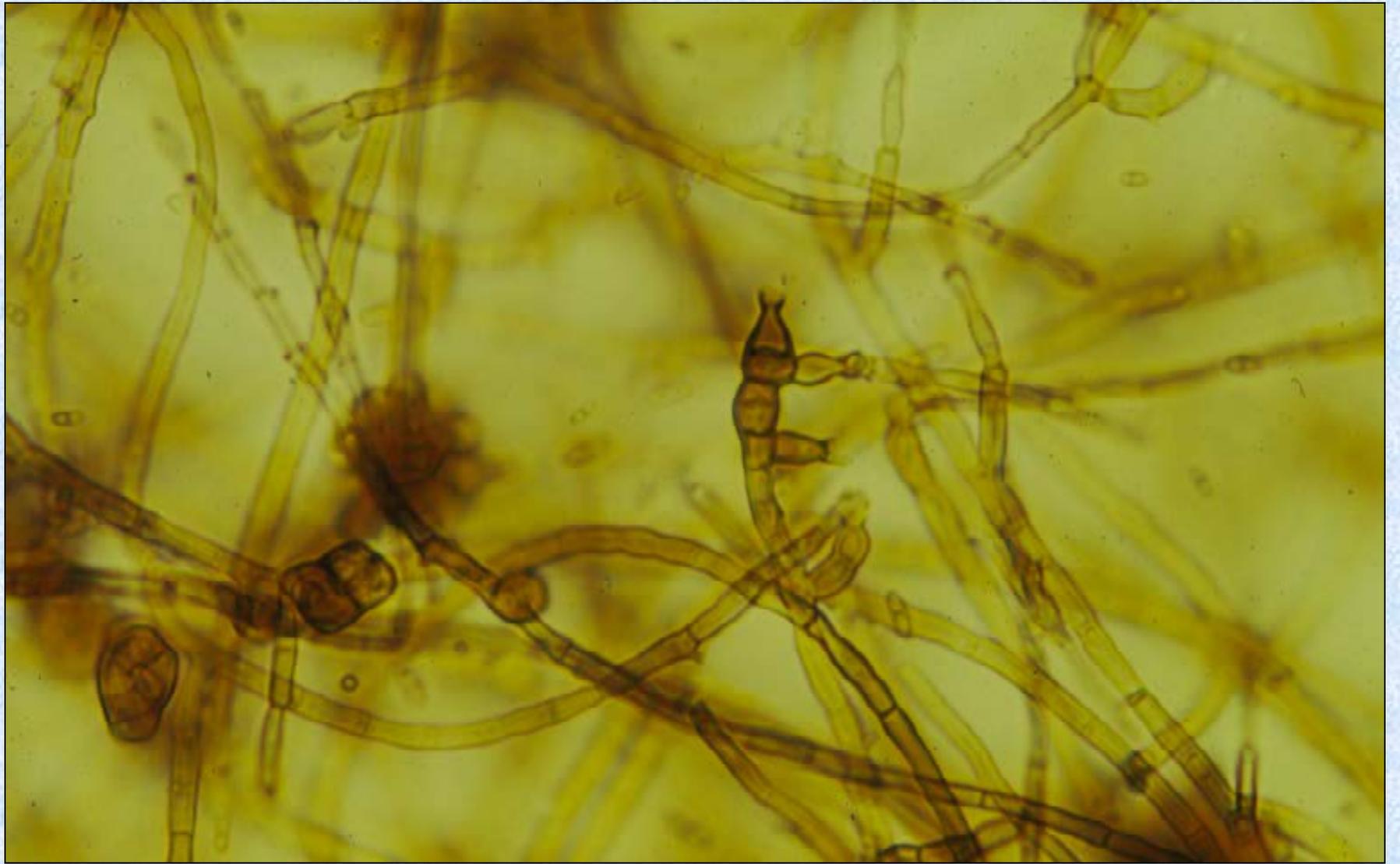


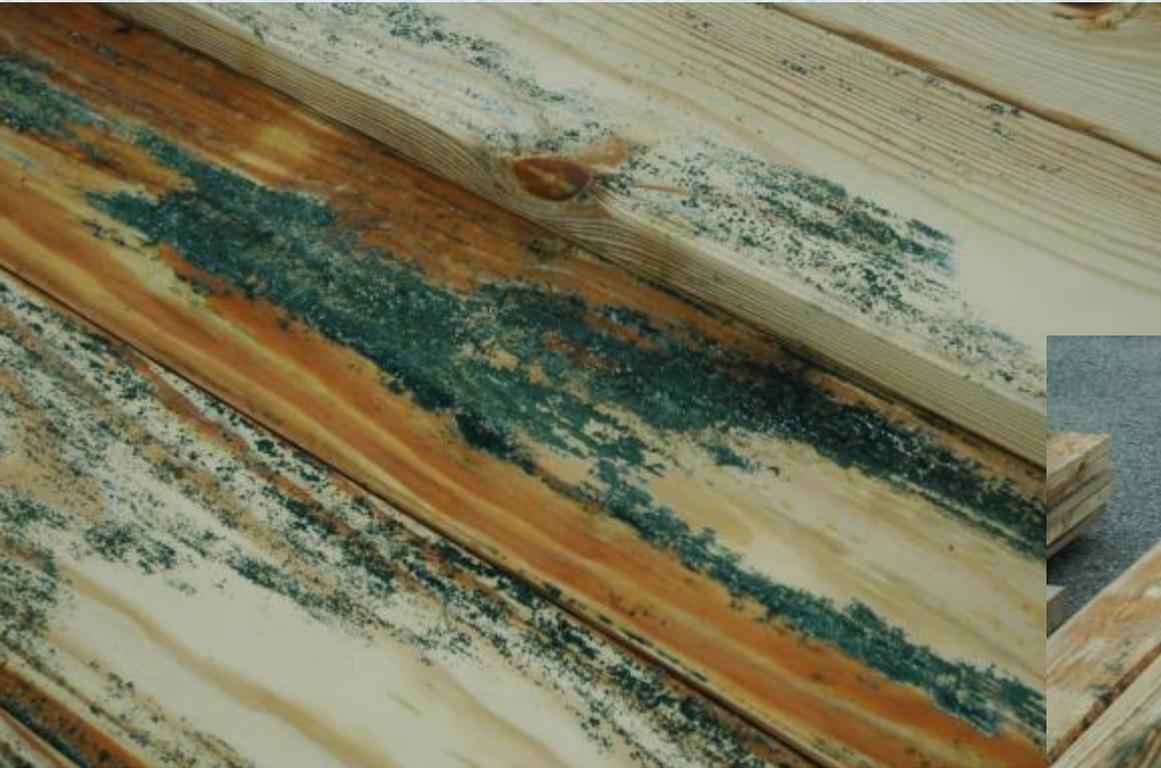


# PENICILLIUM



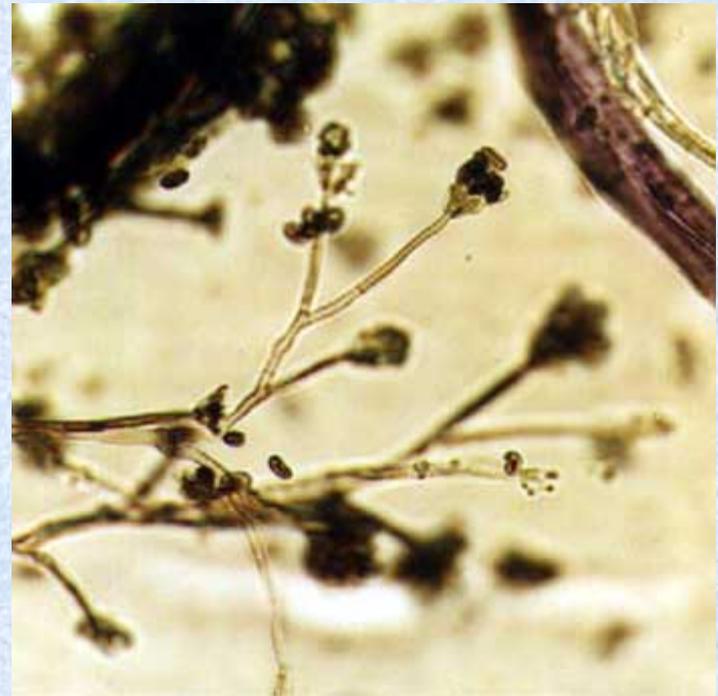
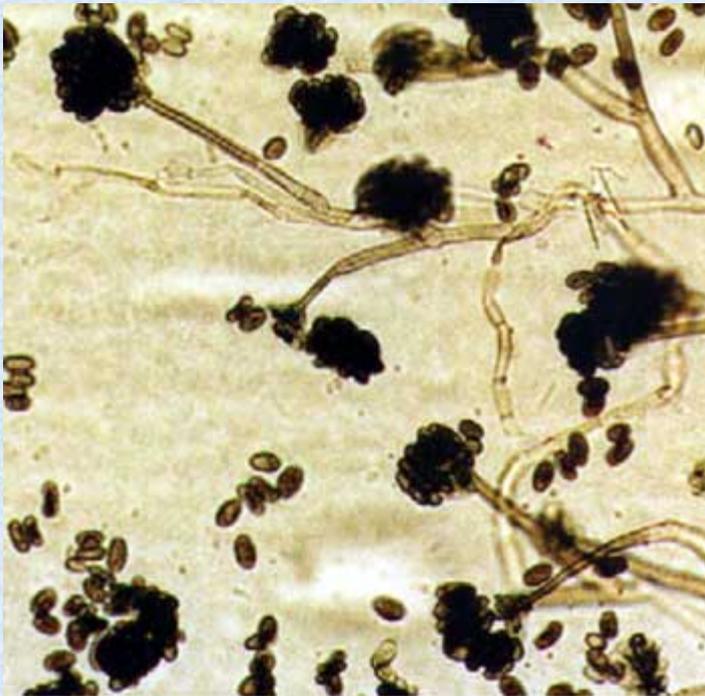






(Courtesy: P. Merrick, 2011)

# STACHYBOTRYS



# Important Genera

 Stachybotrys

 Fusarium

 Penicillium

 Aspergillus

 Chaetomium

 Trichoderma

# Mold Species

- 250 to 300,000 species
- 45 species on Douglas-fir sapwood lumber in the first 6 weeks

# Factors Affecting Fungal Growth

- Sapwood Content
- Temperature
- Wood Moisture Content
- Time of Year
- Treatments

# *Insect Contributors: Ambrosia beetles*

Ambrosia Beetle



# Wood Deterioration     *Wood destroying Insects*

Ambrosia Beetle Damage in a Peeler Core



# Metallic Wood borers



# *Longhorned beetles*



# **Role of Processing in Stain**

How fungi get to wood



[calhoun.env.duke.edu/files/Feller%20Buncher%20..](http://calhoun.env.duke.edu/files/Feller%20Buncher%20..)



[www.forestryimages.org/browse/detail.cfm?imgn...](http://www.forestryimages.org/browse/detail.cfm?imgn...)



[heavymachine.blogspot.com/images/909j-feller-...](https://heavymachine.blogspot.com/images/909j-feller-...)



[www.farmi.us/\\_borders/mxextentionpag8.jpg](http://www.farmi.us/_borders/mxextentionpag8.jpg)



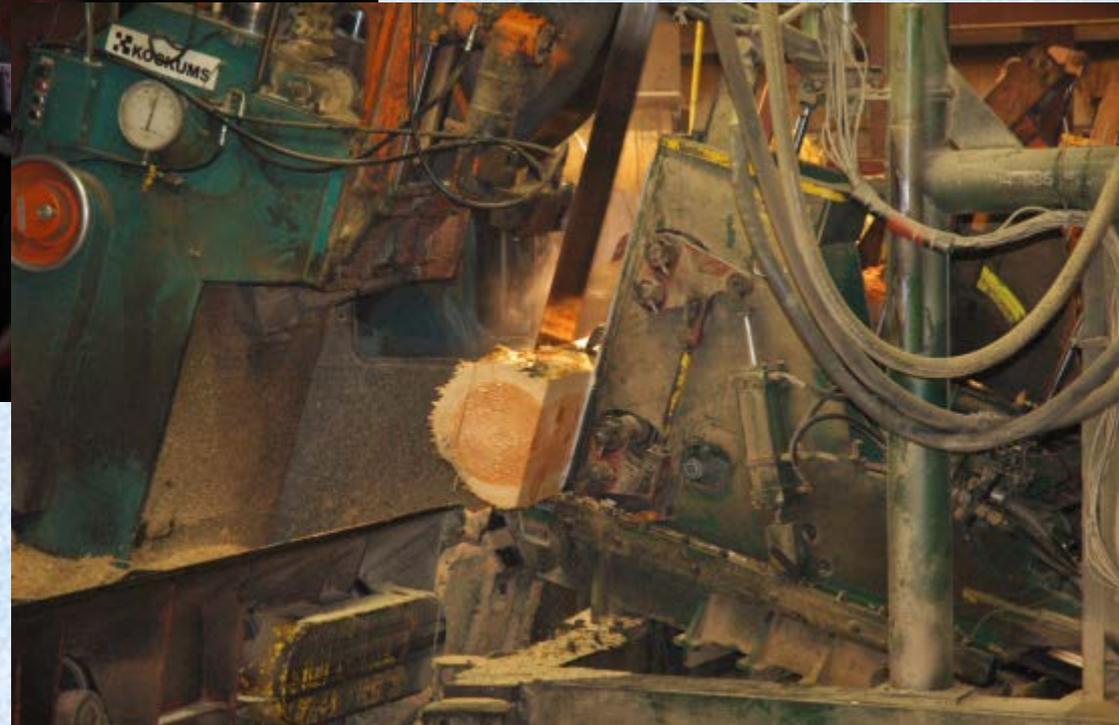


[evergreenmagazine.com/.../viewAlbum.html](http://evergreenmagazine.com/.../viewAlbum.html)

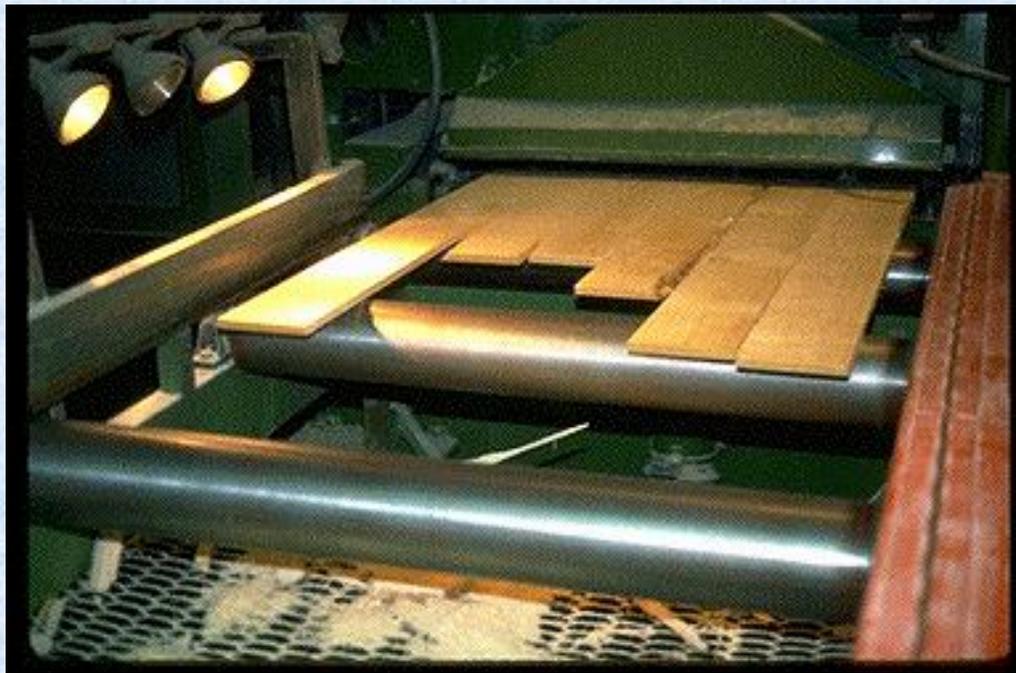


[www.gilbeck.net/scaleday/scaling008.jpg](http://www.gilbeck.net/scaleday/scaling008.jpg)









# Sapstain Spray



(Courtesy of P. Schneider, 2011)

# Spray Boxes



# Chemical Dipping



# Anti Stain/Mold Chemicals

- Propiconazole
- 3-iodo-2-propynyl butyl carbamate (IPBC)
- didecyl dimethyl ammonium chloride (DDAC)
- Methylene bithiocyanate (MBT)
- Tetrachloroisophthalonitrile
- Oxine copper

# Fungicide vs Fungistat

- Fungicide kills spores and hyphae
- Fungistat stops growth but may not kill fungus
- Stain chemicals can be both- but do not function well against hyphae that are already in wood

# Treatment Delivery

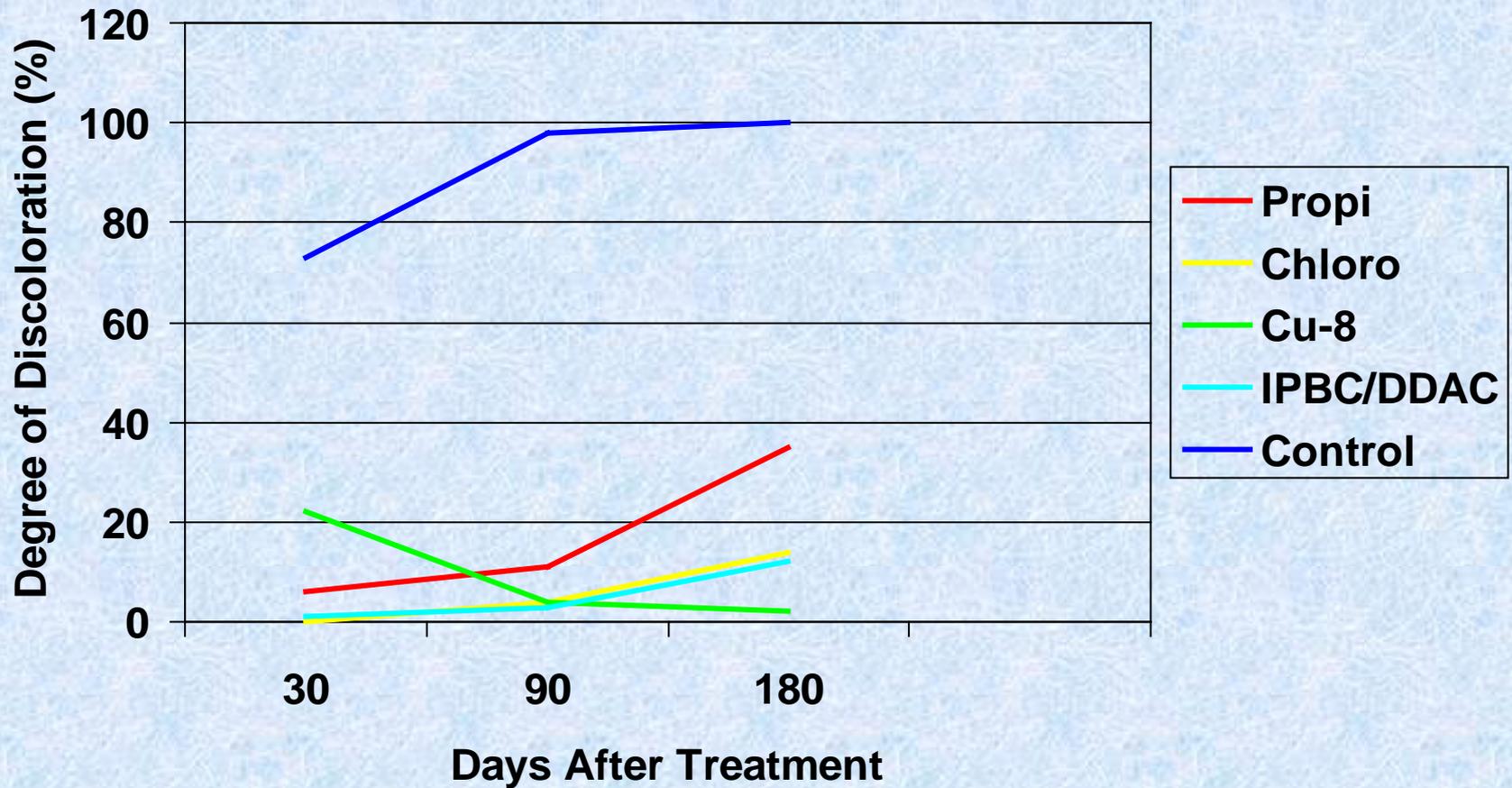
- Mostly surface- a little bit inside helps
- Must have sufficient amount/unit area  
(varies with product)



# Treatment Delivery

- Mostly surface- a little bit inside helps
- Must have sufficient amount/unit area (varies with product)
- Periodic chemical assessment is useful
- Periodic trials are also useful since inerts in product can change

# Performance of Antisapstain Chemicals



# Chemical Issues

- Fungi growing through the protective layer
- Mills using too little chemical
- Fungal resistance?

# Role of Preinfection





# Role of Storage before Planing



(Courtesy: P. Merrick, 2011)

# Longterm Storage Issues



(Courtesy: D. Stallcop, 2011)

# Bundle Storage Issues



(Courtesy: P. Merrick, 2011)





# Who to Blame?

# Who to Blame?



# Old Logs

- Logs in deck 6 to 18 months- either in woods or in yard (it all counts)
- Wood is pre-infected- fungi more difficult to control
- Spores and hyphae from infected wood carried on saws to clean wood
- Delays between saw and planer

# What to Do

- Control time in woods
- Control time in log deck
- Sprinkle decks
- Treat lumber ASAP or sooner
- Use proper chemical levels

# Ideal Processing Times

- We say 24 hours
- Some use 14 days
- Obviously- 14 days is too long/24 hr is unreasonable
- 2 to 3 days would be ideal- but it is seasonal
- Once fungi in wood begin growing to surface - they become difficult to control

# Reality

- Logs in woods for days to months
- Logs in deck for weeks to months
- Lumber held for days to weeks before final planning and treatment
- Lumber sits in depots for weeks to months



# Ideal System

- Log flow tailored to production- 3 months max storage
- Treatment within 72 hours of sawing
- Good maintenance of spray booths
- Regular QC on lumber to ensure adequate treatment levels

