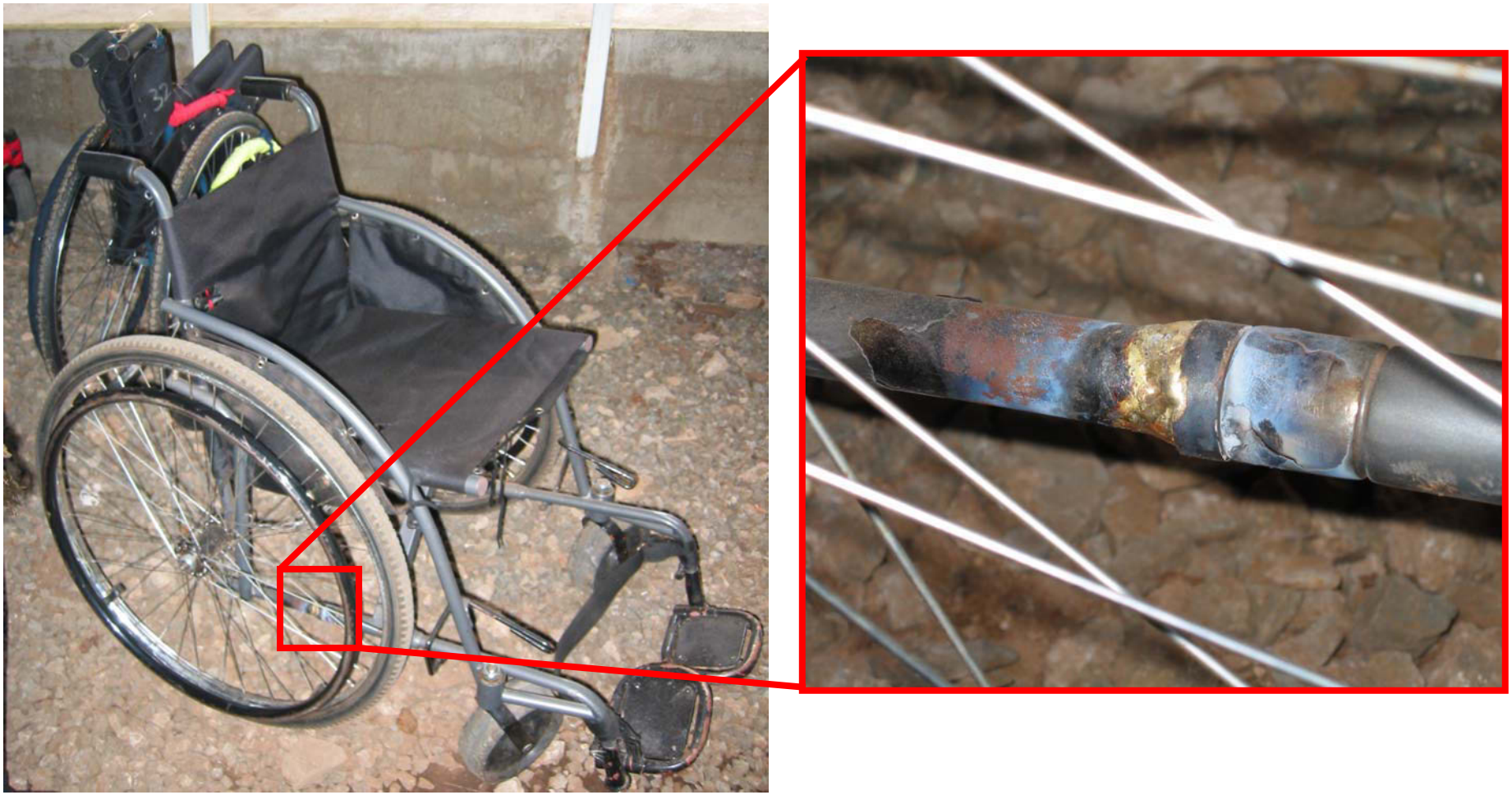
EC.721 Wheelchair Design in Developing Countries

Spring 2009

MATERIAL PROPERTIES AND PERFORMANCE



HOT WORKING VIDEOS

- **Hot forging a nail**

http://www.youtube.com/watch?v=7YNbMAAxvnQ

- **Cold forging a metal bar**

http://www.youtube.com/watch?v=Zdi6C-oADEI

MECHANICAL PROPERTIES OF 1020 STEEL
Effects on performance from different processes

Treatment	Tensile Strength (MPa)	Ductility (%EL)
Hot rolled	210	25
Cold drawn	350	15
Annealed (@ 870 deg C)	295	36.5
Normalized (@ 925 deg C)	345	38.5

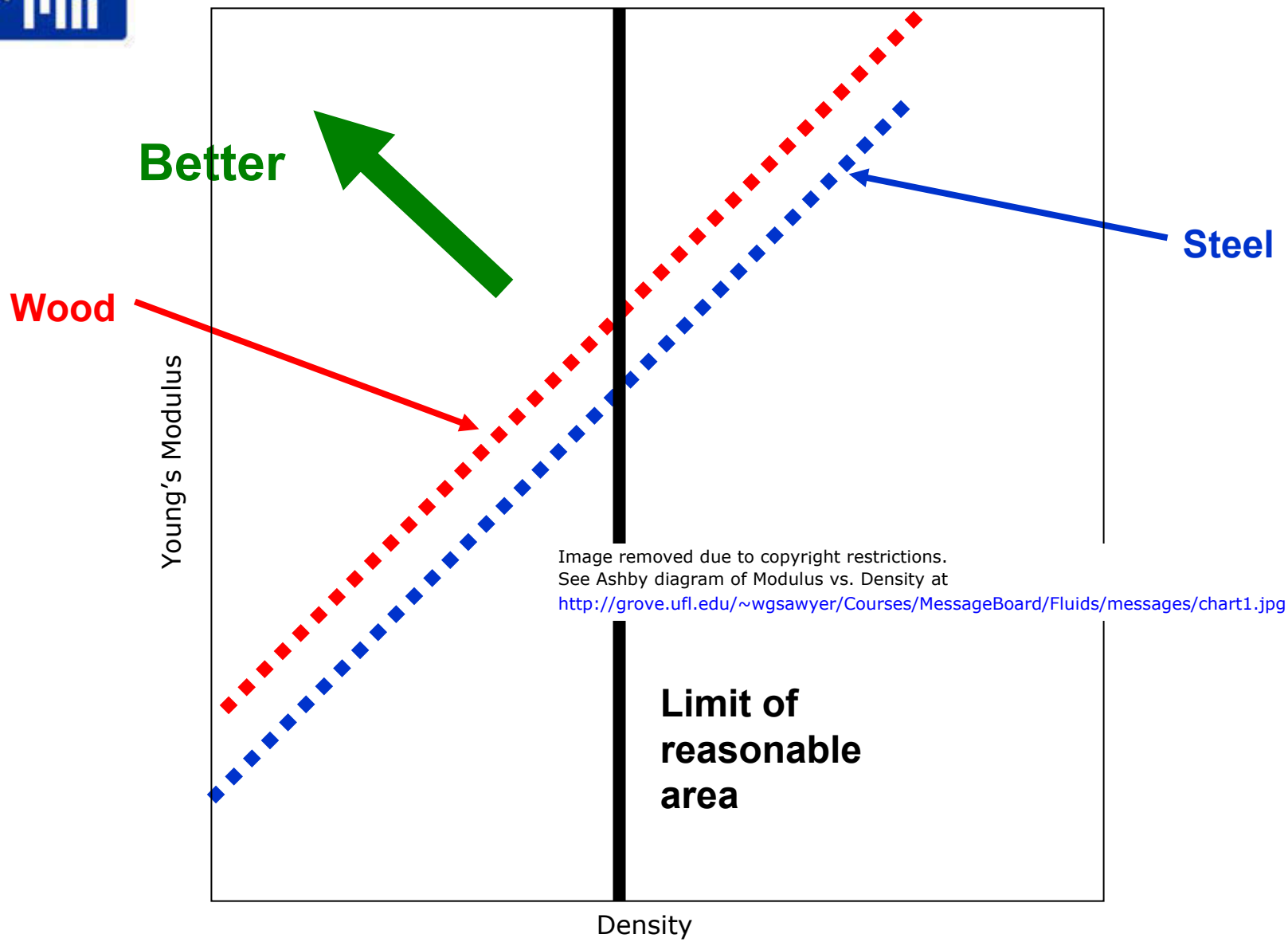
From W. Callister, Materials Science and Engineering

STEEL YIELD STRENGTH VS. ELONGATION
Steel alloys with different amounts of carbon

AISI #	Tensile Strength (MPa)	Ductility (%EL)
1010	180	28
1020	205	25
1040	585	19
1080	980	13
1095	830	10

From W. Callister, Materials Science and Engineering

MODULUS VS. DENSITY



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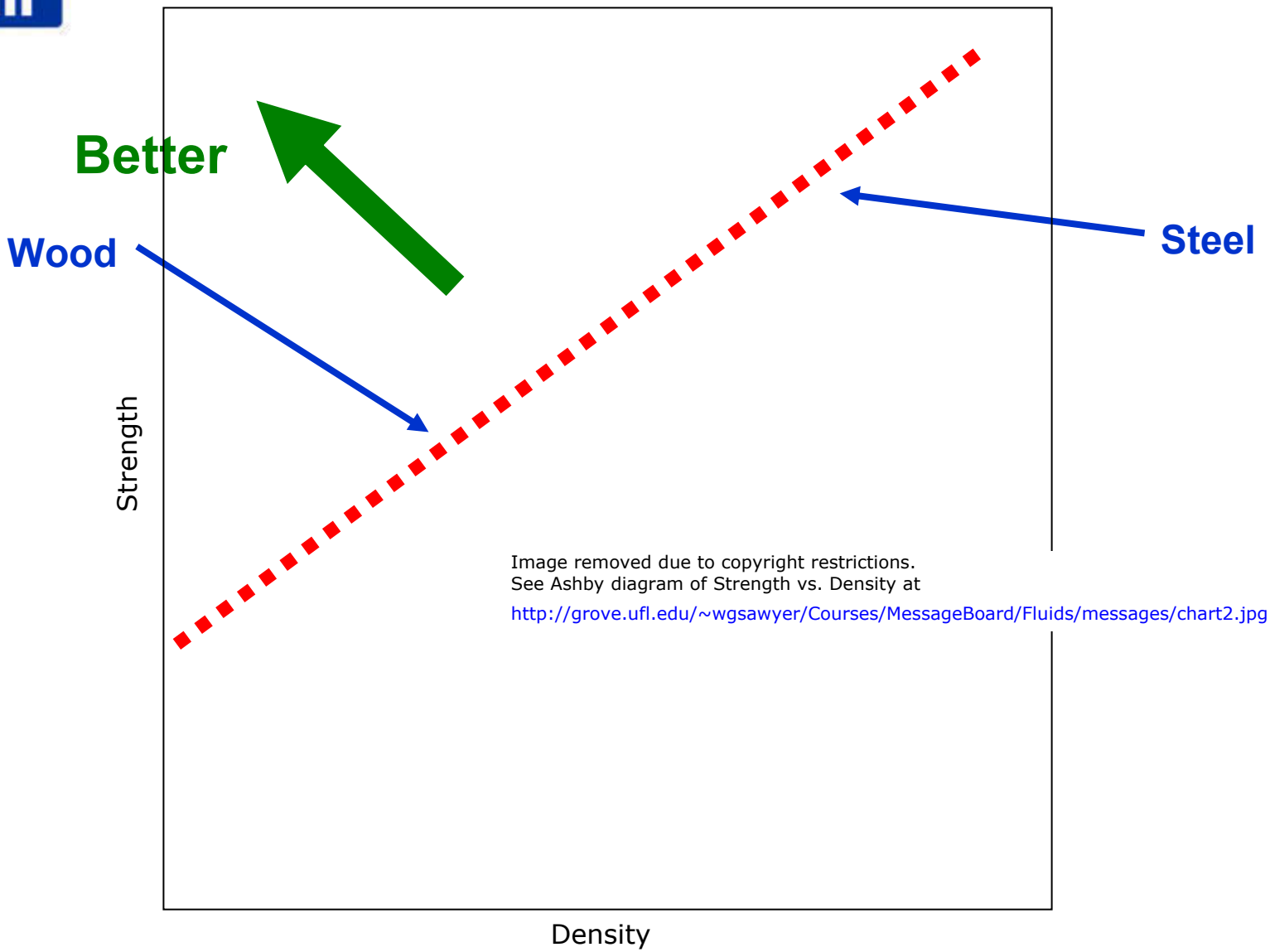
See Ashby diagram of Modulus vs. Density at
http://grove.ufl.edu/~wgsawyer/Courses/MessageBoard/Fluids/messages/chart1.jpg

STRENGTH VS. DENSITY



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See Ashby diagram of Strength vs. Density at
http://grove.ufl.edu/~wgsawyer/Courses/MessageBoard/Fluids/messages/chart2.jpg

HOMEWORK

- **Read "Mechanical Principles of Wheelchair Design"**