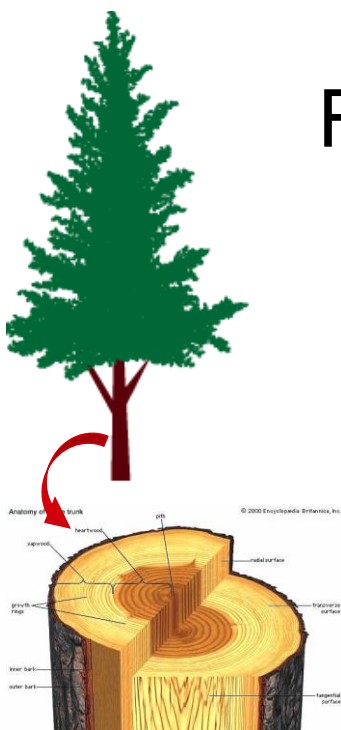


# Future materials from wood

## 木材からの将来の材料

Subir Kumar Biswas

JSPS Postdoctoral Researcher  
Laboratory of Active Bio-Based Materials, RISH  
Kyoto University



What is wood?

木材とは何ですか？

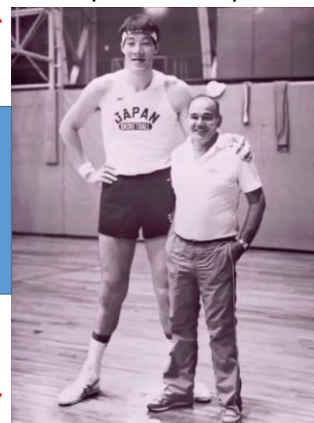
# The tallest tree in the world

世界で最も高い木



Coast redwood (*Sequoia sempervirens*)  
in California, USA

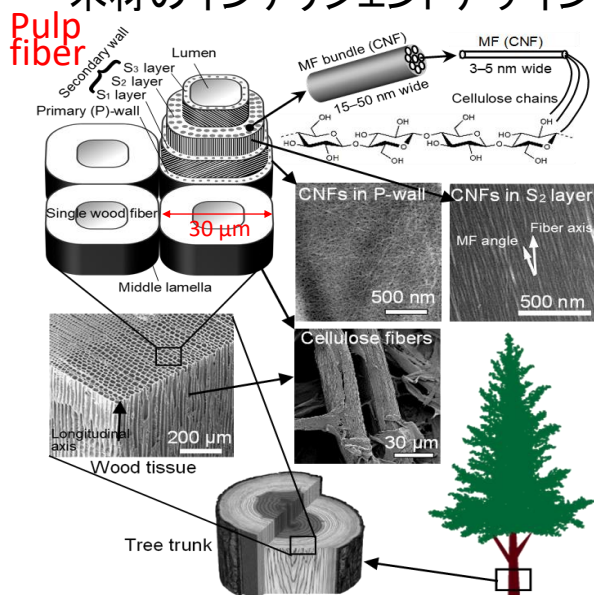
Yasutaka Okayama  
(岡山恭崇)



How does a tree support its huge body?  
木はその巨大な体をどのように支えていますか？

## The intelligent design of wood

木材のインテリジェントデザイン



- Cellulose nanofiber (CNF)

セルロースナノファイバー

- Seven times stronger than steel

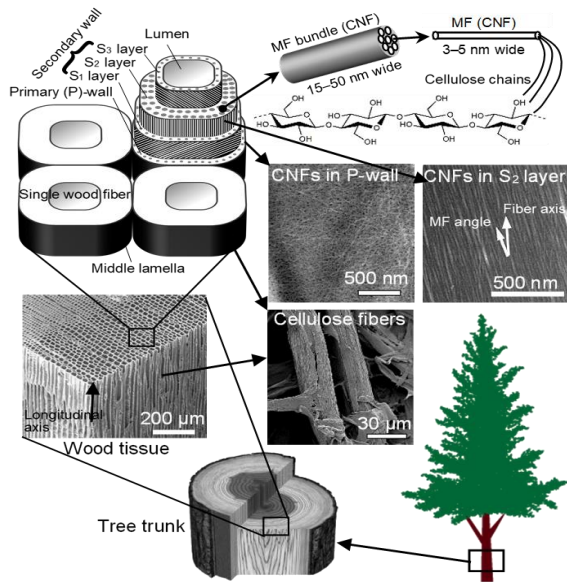
鋼の7倍の強度

- Five times lighter than steel

スチールの5倍軽い

# The intelligent design of wood

## 木材のインテリジェントデザイン



Length scale:

1 m = 100 cm = 1000 mm

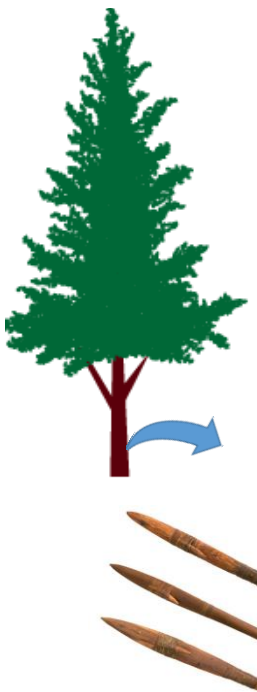
1 mm = 1000 μm

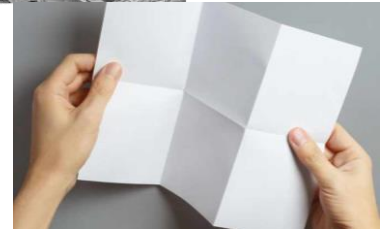
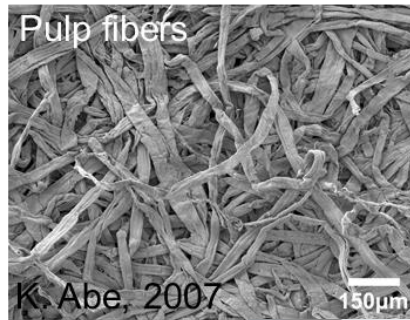
1 μm = 1000 nm

1 nm = 10<sup>-9</sup> m

## Traditional uses of wood

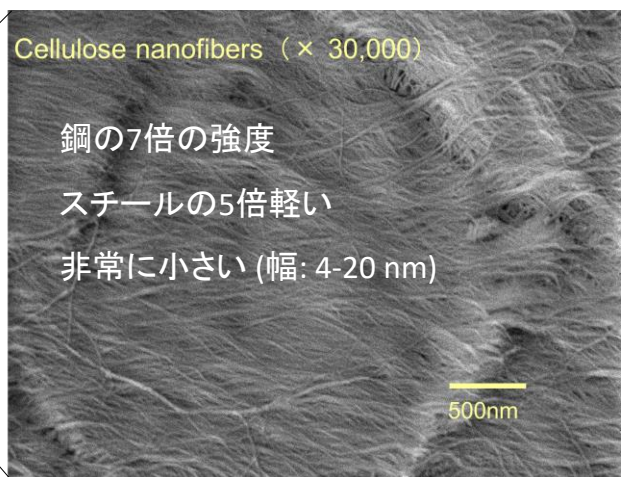
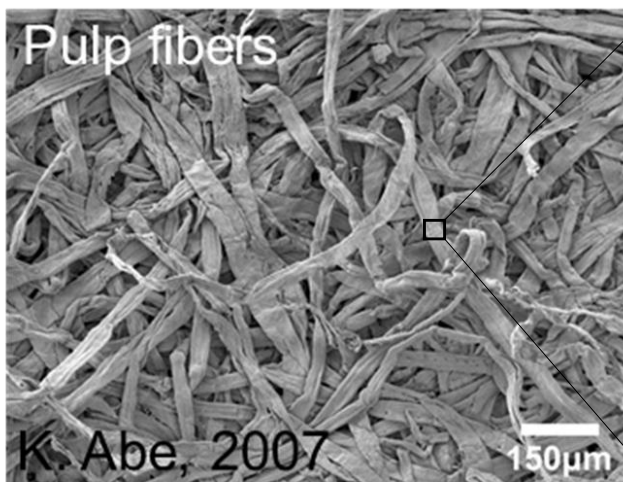
### 木の伝統的な使用法





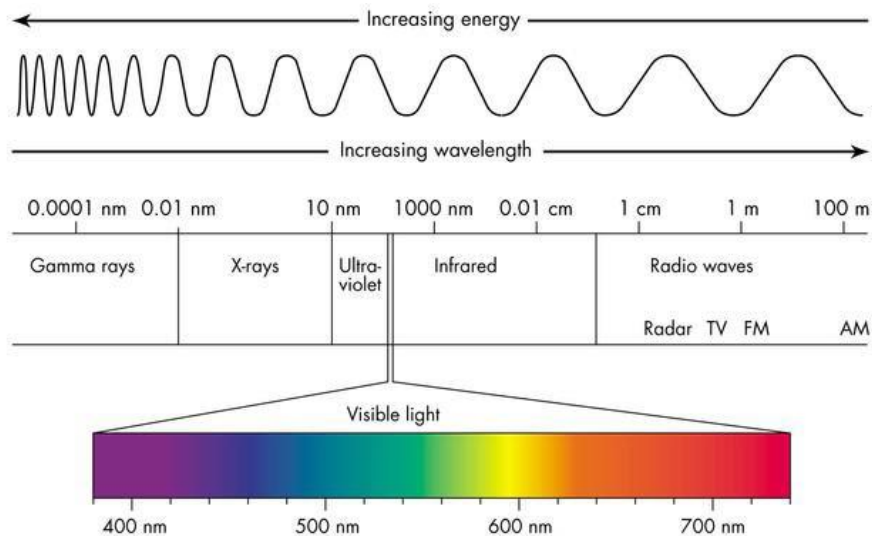
My goal is to make next-generation wood-derived products for advanced applications

私の目標は、高度なアプリケーション向けの次世代の木材由来製品を作ることです



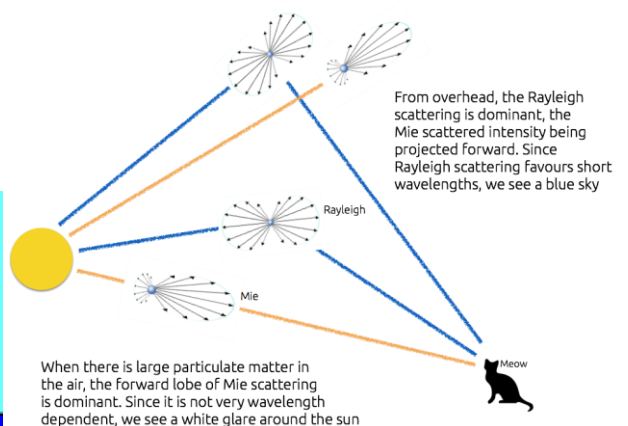
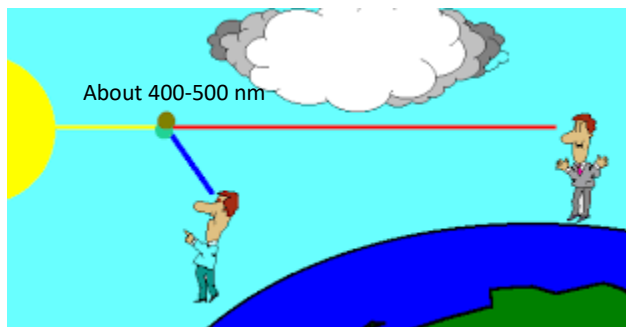
What wavelengths of light we can see?

私たちが見ることができる光の波長はどのぐらいですか？



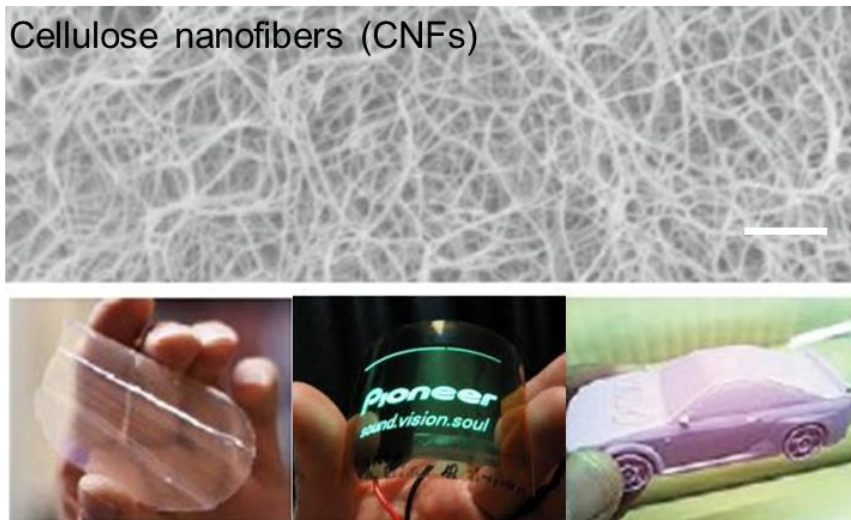
Why does the sky look blue?

なぜ空が青く見えるのですか？





## Optically transparent nanocomposites

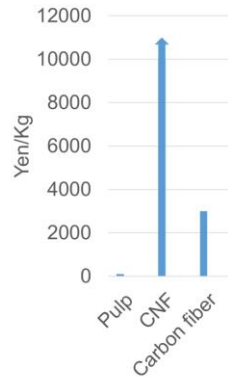
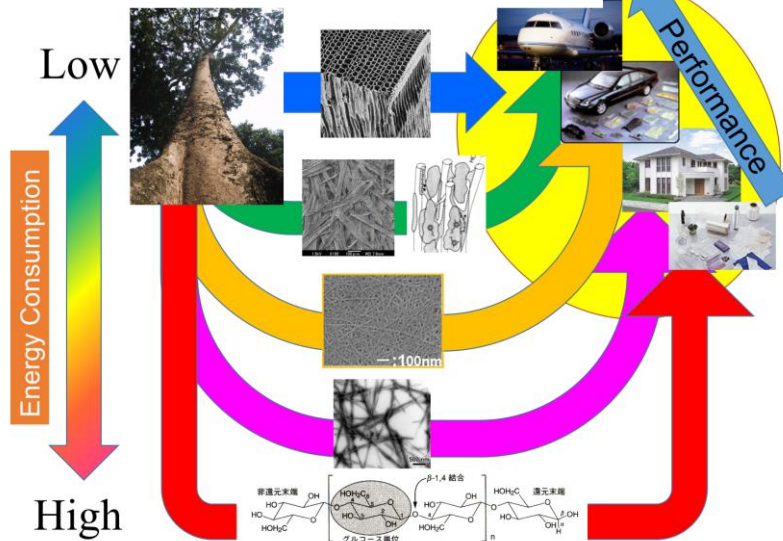


## Optically transparent nanocomposites



ガラスとプラスチックの交換

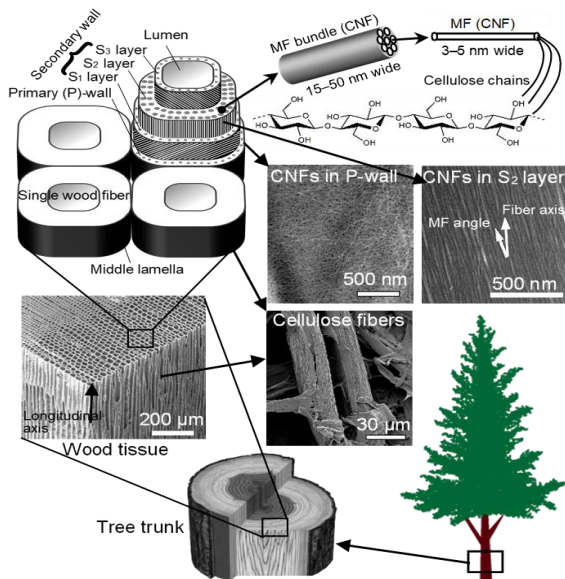
### Future direction of wood-derived materials



Ref./source: <https://www.indexmundi.com/commodities/?commodity=wood-pulp&months=60>

Ref./source: Prof. H. Yano

## Can we make a wood transparent?



Length scale:

1 m = 100 cm = 1000 mm

1 mm = 1000 μm

1 μm = 1000 nm

1 nm = 10<sup>-9</sup> m

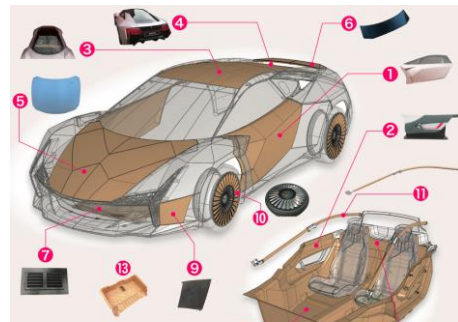
# Transparent wood



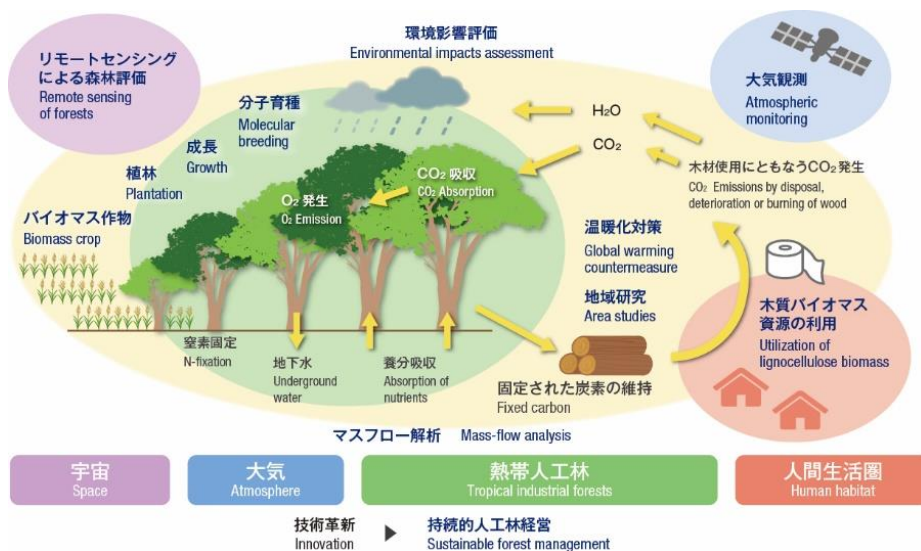
Clear wood window



Strong and shatter proof



# Sustainable and carbon neutral products





Thank you all!