Wood Structure – macrostructure at time scale to ultrastructure at molecular scale

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Wood, the secondary xylem, is the most abundant terrestrial biotic product. From the Stone Age relationship between wood and man has always been intimate, and even unconsciously, wood surrounds us because of its versatility to make constructions, furniture, tools, fibers and paper. Therefore, wood is an important subject to be studied from many different aspects: paleobotany, ethnobotany, archeology, history in addition to the conventional view points such as biology, chemistry, physics and engineering.

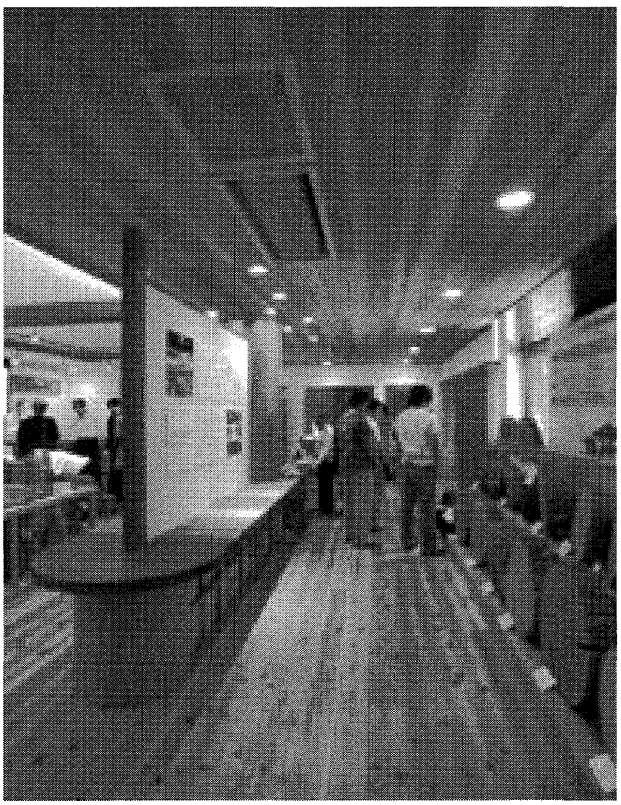
The wood collection at xylarium, designated as KYOw, has been serving as basis for the exchange of knowledge and experiences in wood anatomy at national and international levels. Our activity linked to this xylarium are (1) research and education of wood anatomy and identification, (2) original collection of timbers from national cultural heritages, (3) indexing, exchange, home page publishing of wood collections, (4) rendering services on the identification of the taxon of wooden objects, and (5) promotion of cooperative research project.

In addition, wood identification project of whole parts of old construction equivalent of cultural heritage that we started recently, provides a valuable dataset to study the usage of timbers that differs by era or locality. Another new study includes dendroclimatological approach. Signals of climate recorded in the annual rings are to be analyzed by anatomical and chemical methods using precisely dated wood collection from our xylarium.

Apart from the xylarium, our laboratory is involved in many structural studies of plant polysaccharides and plant cell walls. One of the examples from the cellulose fields is *in vitro* cellulose synthesizing experiment in collaboration with a Swedish group at KTH. From higher plant suspension cultured cells as well as one of the cellulose synthesizing animals the system to synthesize cellulose *in vitro* is being established. Also novel systems to characterize *in vitro* product are under development.

Another example from cell wall fields is about the mechanism of tensile force generation in relation to the ultrastructure of gelatinous fibers in tension wood. Morphological and molecular approach has been unveiling the complicated role of the key molecule and a unique enzyme that regulate them to function together.

Finally, as a mission project, functional biocomposite materials are under development by mimicking biological process and ultrastructure. Polysaccharides-based biomedical materials are investigated in collaboration with biomaterial experts.



A snapshot of reformed Xylarium.