

Synchrotron X-ray micro-tomography –a new tool for wood identification

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Conventional plant taxonomy relies on the characteristics of reproductive organs of plants, though more recently the molecular phylogeny based on DNA analysis is the main stream of the development. Tree- or forest-watching is very popular in these days because of increasing interests to the eco-system. Most of the introductory textbooks follow the classification of flowers, fruits and leaves and allows us to identify plants at species level and sometimes at sub-species level. On the other hand, wood watching is not as popular but professional, and sometimes important in various aspects. Wood identification based on microscopic characteristics has been established and allows us to discriminate wood samples at genus level.

Wood anatomy requires the observation of microstructure from 3 direction, axial, radial, and tangential directions. A way to do is to use a razor blade for making a thin slice from wood blocks, and prepare the microscopy preparation of corresponding 3 directions. Nevertheless this method becomes simple after training and experience, it is not applicable for example when only too small sample is given as is always the case for national heritage class wood works or artifacts. Therefore, we investigated the use of the synchrotron radiation facility(1) to shed a light on the anatomy of national and world heritage wooden objects. X-ray micro-CT imaging at BL20XU (Fig. 1) was carried out on specimens including cultural assets with a resolution of 0.7 micrometer. Sample twig was trimmed less than 1 mm diameter (long along longitudinal axis), and 11 softwood species has been carefully investigated with a series of programs developed by BL20XU, such as SLICE(2). The resolution is good enough to visualize most of the species-specific anatomical features necessary for the identification (for instance Fig. 2), and the work is in progress.

1. Identification of wooden cultural heritage, SPring8, Harima, Hyogo, Japan, project No 2007B15444
2. Tsukasa Nakano, Akira Tsuchiyama, Kentaro Uesugi, Masayuki Uesugi and Kunio Shinohara (2006) Slice – Software for basic 3-D analysis-. Slice Home Page, <http://www-20bl.spring8.or.jp/slice/>. JASRI.

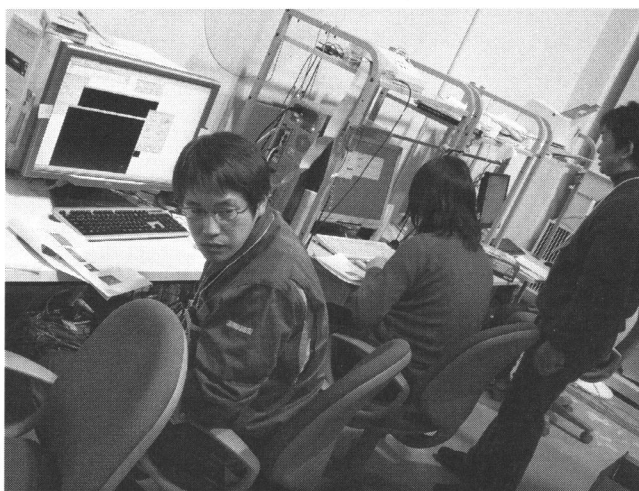


Fig. 1 A snap view of the Experiment at BL20XU.

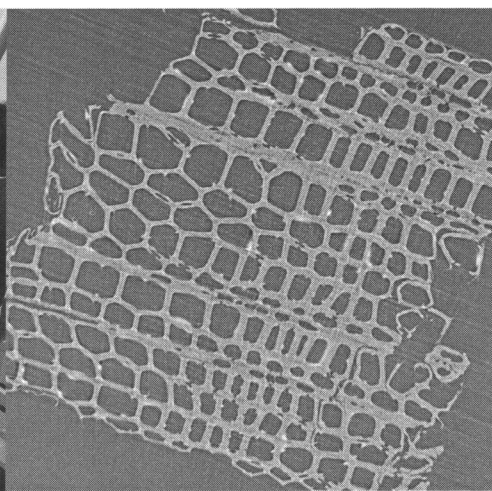


Fig.2 An example of reconstructed slice from ICHII(*Taxus cuspidate*) wood