


科技创新驱动竹藤产业发展

Technology Innovations in Bamboo and rattan Industry Development

江泽慧

2018 世界竹藤大会组委会主席

A dense bamboo forest with various shades of green and brown bamboo stalks. The bamboo stalks are vertical and segmented, with some showing signs of aging or damage. The background is filled with more bamboo, creating a textured and layered appearance. The lighting is natural, highlighting the textures of the bamboo bark.

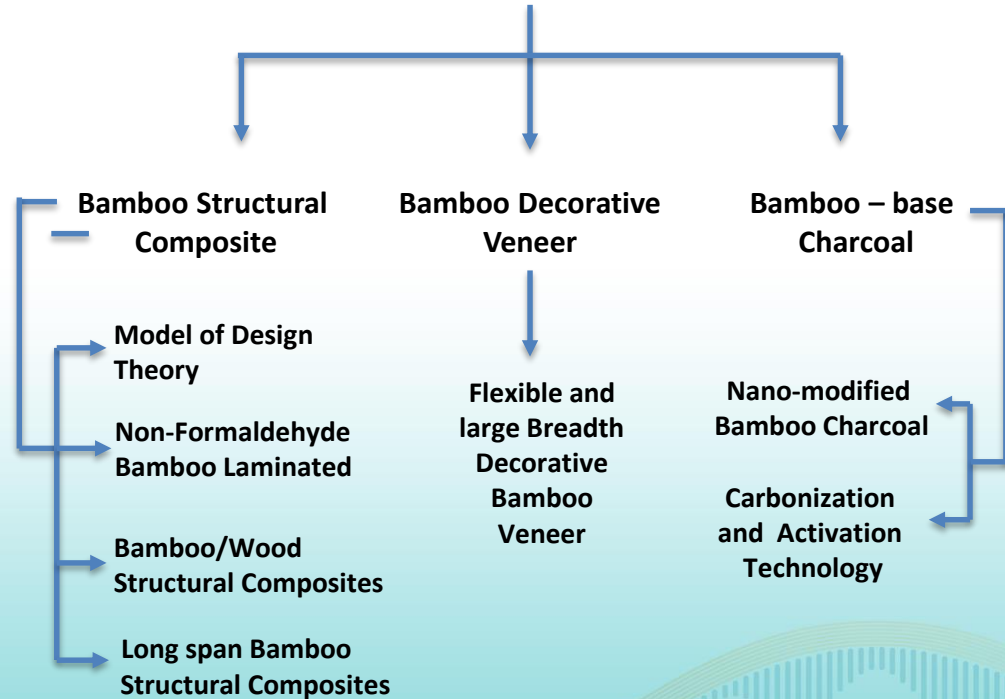
中国是世界竹藤产业的主要
技术研发国

Engineered Bamboo Products

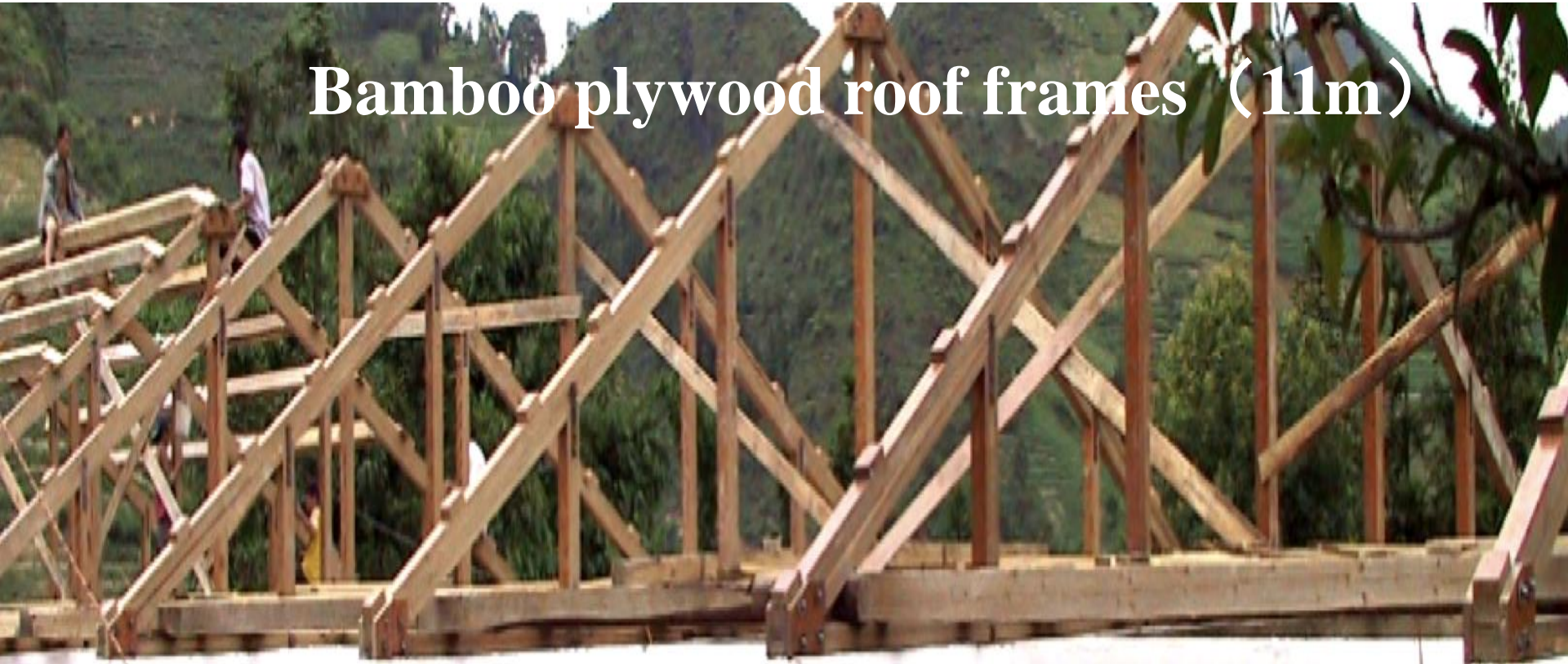
Grand prize of National Progress in Sci. & Tech. in 2006



Engineered Bamboo Products



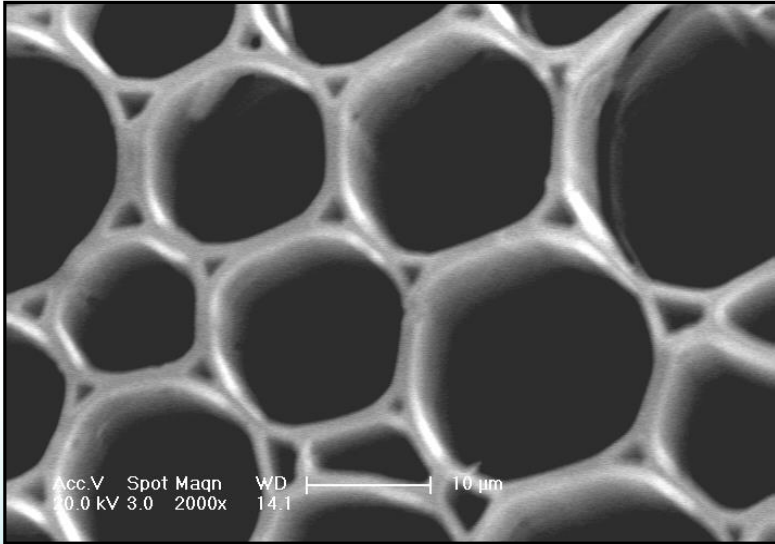
Bamboo plywood roof frames (11m)



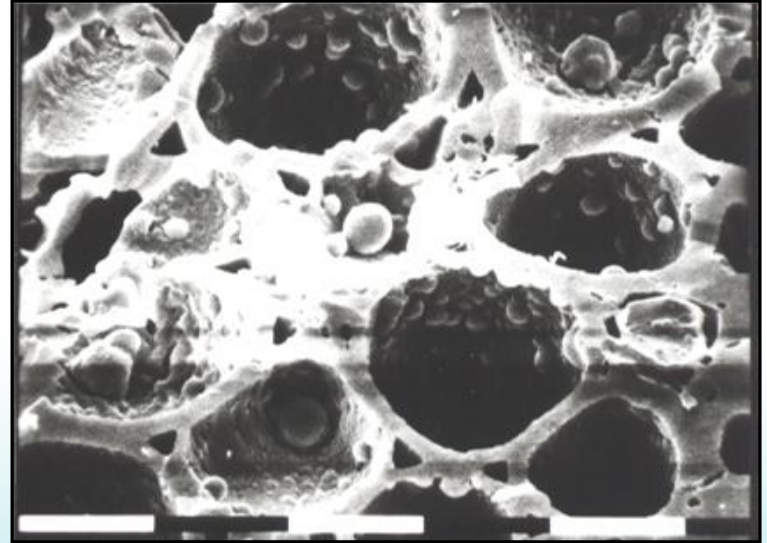
Yunnan pingbian primary school



Bamboo - Base Charcoal



Common bamboo charcoal



Nano - modified bamboo charcoal

Carbonized bamboo veneer (0.3mm)



国家科技进步二等奖和技术发明奖

2nd runner up of National Technology Invention Awards
National Progress in Sci. & Tech. awards



创切微薄竹



竹炭



竹纤维



竹木复合结构理论

Bamboo Charcoal



Bamboo / Viscose Fiber Textiles





Bamboo/wood house 竹木复合建筑



**Doors, Staircase are made of
Bamboo Wood Scrimber**
门、楼梯采用竹木重组材

**Bamboo/wood composite panels
sheathings of walls, roofs and
floorings**
竹木复合板用于墙体、屋面和
楼面的覆盖板

**Chinese fir laminated lumber
used as poles**
柱采用杉木胶合木

**Bamboo wood composite
architecture**
竹木复合梁

我国自主完成了首个竹子 - 毛竹基因组草图

nature genetics

nature.com | Journal home | archive | issue | letter | full text

NATURE GENETICS | LETTER | OPEN

日本語要約

The draft genome of the fast-growing non-timber forest species moso bamboo (*Phyllostachys heterocycla*)

Zhenhua Peng Ying Lu Lubin Li Qiang Zhao Qi Feng Zhimin Gao Hengyun Lu Tao Hu Na Yao Kunyan Liu Yan Li Danlin Fan Yunli Guo Wenjun Li Yiqi Lu Qijun Weng Congcong Zhou Lei Zhang Tao Huang Yan Zhao Chuanrang Zhu Xinge Liu Xuewen Yang Tao Wang Kun Miao Caiyun Zhuang Xiaolu Cao Wenli Tang Guanshui Liu Yingli Liu Jie Chen Zhenjing Liu Licai Yuan Zhenhua Liu Xuehui Huang Tingting Lu Benhua Fei Zemin Ning Bin Han Zehui Jiang

Affiliations | Contributions | Corresponding authors

Nature Genetics 45, 456–461 (2013) | doi:10.1038/ng.2569
Received 20 July 2012 | Accepted 01 February 2013 | Published online 24 February 2013

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the most important non-timber forest products in the world. However, no species in the Bambusoideae subfamily has been sequenced. Here, we report a high-quality draft genome sequence of moso bamboo (*P. heterocycla* var. *pubescens*). The 2.05-Gb assembly covers 95% of the genomic region. Gene prediction modeling identified 31,987 genes, most of which are supported by cDNA and deep RNA sequencing data. Analyses of clustered gene families and gene collinearity show that bamboo underwent whole-genome duplication 7–12 million years ago. Identification of gene families that are key in cell wall biosynthesis suggests that the whole-genome duplication event generated more gene duplicates involved in bamboo shoot development. RNA sequencing analysis of bamboo flowering tissues suggests a potential connection between drought-responsive and flowering genes.

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构建首个竹类植物基因组功能注释与分析平台

Establishment of The first bamboo plant genome annotation and analysis platform

注释出31,987个高度可靠的毛竹基因
Almost 32000 of high reliable moso bamboo gene annotated

BambooGDB

Bamboo Genome Database

ICBR INTERNATIONAL CENTRE FOR BAMBOO AND RATTAN

Home Search Browse Pathway PPI GBrowse Tools Documents Download

Overview of BambooGDB

BambooGDB, a bamboo genome database with comprehensive functional annotation and extensible analysis platform. The *de novo* sequenced genome data by [Bamboo Genome Project](#), full-length cDNA and RNA-seq data for moso bamboo (*Phyllostachys edulis*, once-used Latin name was *Phyllostachys heterocycla*) together composed the main contents of this database. Based on these sequence data, a comprehensive function annotation for bamboo genome was made. Besides, an analytical platform providing visualization of genomic data, protein-protein interactions network, pathway analysis and comparative genomic analysis was also constructed. Moreover, diverse and powerful search tools and a convenient browser were incorporated to facilitate the navigation of these data.

BambooGDB is developed with the following features briefly:

- Providing genome sequence of moso bamboo with comprehensive functional annotations under multi-levels (such as gene, protein function and protein structure);
- Presenting comparative analyses between bamboo and its relative plants by OrthoMCL algorithm and BLAST;
- Integrating and exhibiting multi-level results from published studies on moso bamboo such as expression

Introduction

Bamboo Genome project

News

nature genetics

The moso bamboo genome has been published online in [nature genetics](#) on 17 February 2013

Related Links

Genetic and genome research on bamboo and rattan

LETTERS

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SCIENCE

GigaScience, 6, 2017, 1–7

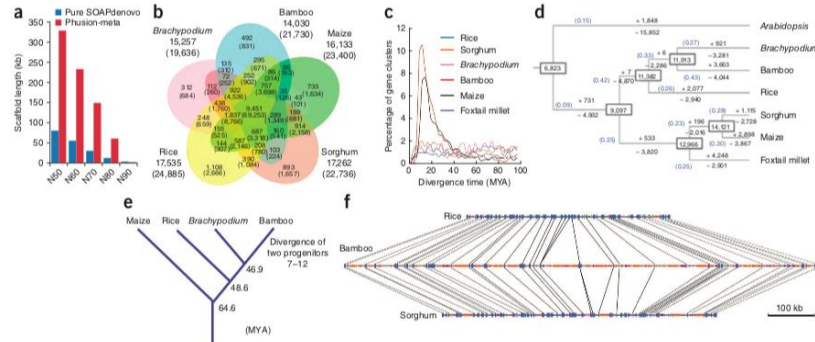
doi: 10.1093/gigascience/gix046

Advance Access Publication Date: 16 June 2017

Commentary

The draft genome of the fast-growing non-timber forest species moso bamboo (*Phyllostachys heterocycla*)

Zhenhua Peng^{1,4}, Ying Lu^{2,4}, Lubin Li^{1,4}, Qiang Zhao^{2,4}, Qi Feng^{2,4}, Zhimin Gao^{3,4}, Hengyun Lu², Tao Hu³, Na Yao¹, Kunyan Liu², Yan Li², Danlin Fan², Yunli Guo², Wenjun Li², Yiqi Lu², Qijun Weng², KongCong Zhou², Lei Zhang², Tao Huang², Yan Zhao², Chuanrang Zhu², Xinge Liu³, Xuewen Yang³, Tao Wang¹, Kun Miao¹, Caiyun Zhuang¹, Xiaolu Cao¹, Wenli Tang³, Guanshui Liu³, Yingli Liu³, Jie Chen¹, Zhenjing Liu¹, Licai Yuan³, Zhenhua Liu¹, Xuehui Huang², Tingting Lu², Benhua Fei³, Zemin Ning², Bin Han² & Zehui Jiang^{1,3}



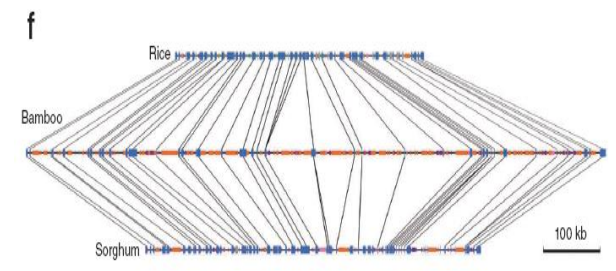
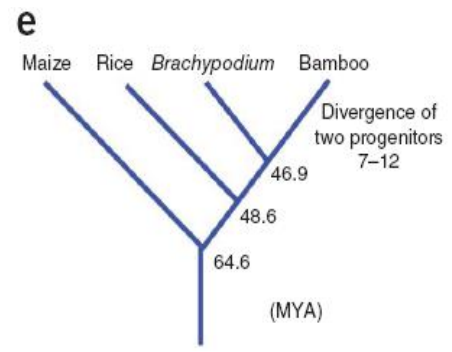
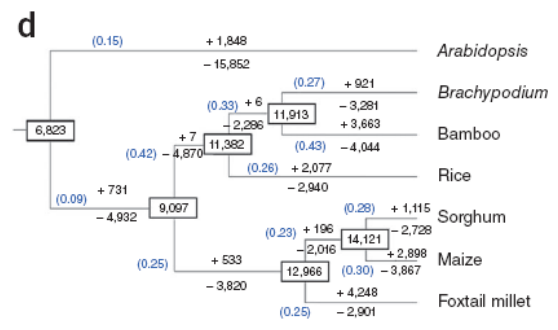
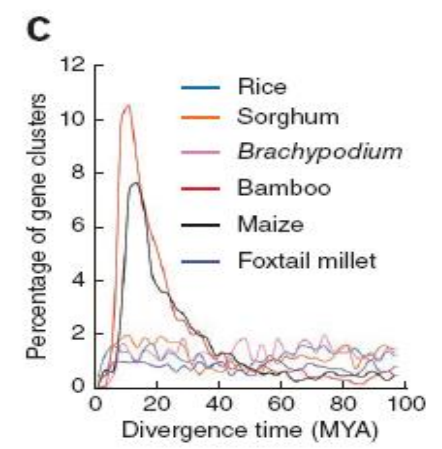
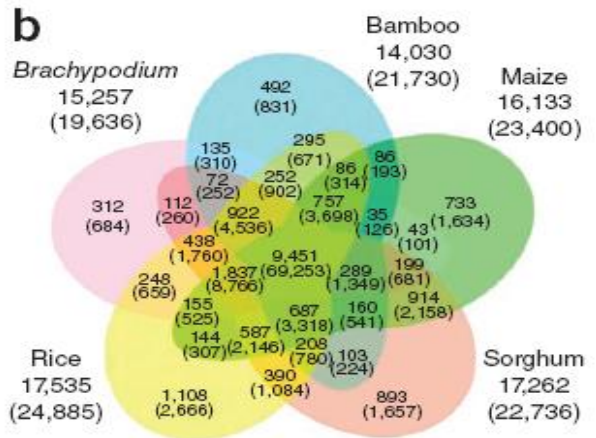
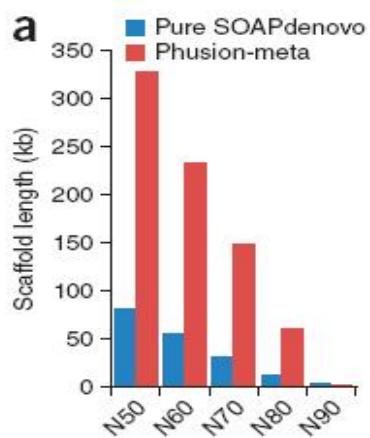
Peng et al., 2013, *The first reference genome for bamboo species.*

COMMENTARY

Announcing the Genome Atlas of Bamboo and Rattan (GABR) project: promoting research in evolution and in economically and ecologically beneficial plants

Hansheng Zhao^{1,†}, Shancen Zhao^{2,†}, International Network for Bamboo and Rattan^{3,†}, Benhua Fei¹, Huan Liu², Huanming Yang², Honghai Dai¹, Dan Wang¹, Wei Jin³, Feng Tang¹, Qiang Gao², Hang Xun¹, Yuwei Wang¹, Lianghua Qi^{1,4,5}, Xianghua Yue^{1,6}, Shuyan Lin⁷, Lianfeng Gu⁸, Lubin Li⁹, Tiansheng Zhu¹⁰, Qiang Wei^{11,12}, Zhen Su¹³, Tarmeze Bin Wanoup Ariffin Wan¹⁴, Daniel A. Ofori¹⁵, Roberto Magno de Castro e Silva¹⁸, Antonio Ludovico Beraldo¹⁹, Zhimin Gao^{1,*}, Xin Liu^{2,*} and Zehui Jiang^{1,*}

Launch the Initiative on Global Genome Atlas of Bamboo and Rattan to complete the sequencing of the transcriptome of 1000 bamboo species and the genome of 5 rattan species, 2017.



Assemblies and comparative genomics

竹质环保绿色新产品不断涌现

Bamboo made Environmentally friendly green product



竹塑复合材料

bamboo /plastic composite





Bamboo Architecture





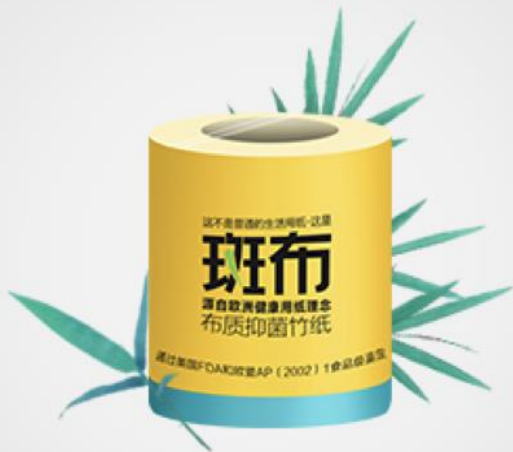
Bamboo Decorative Materials



Bamboo Flooring

Bamboo Furniture





卷纸

· 布质生态竹纸 ·

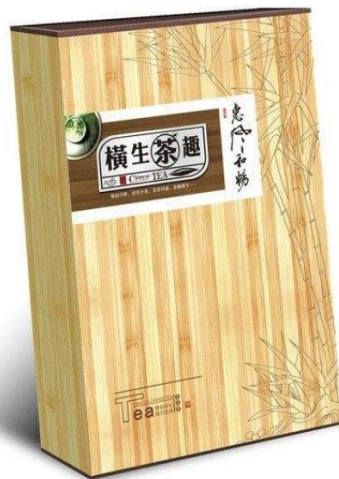


抽纸

· 布质生态竹纸 ·

Bamboo Paper

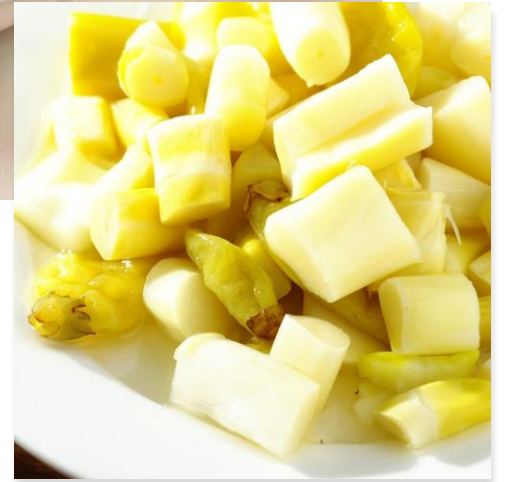
Bamboo Packaging



Bamboo Mat 竹席



Bamboo Shoot 竹笋

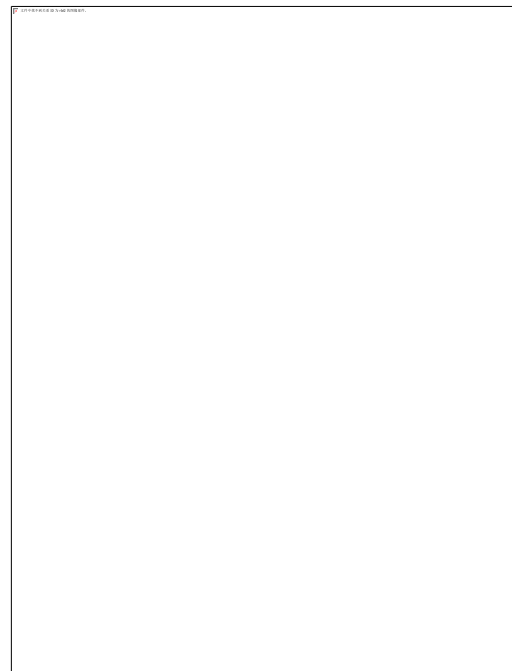
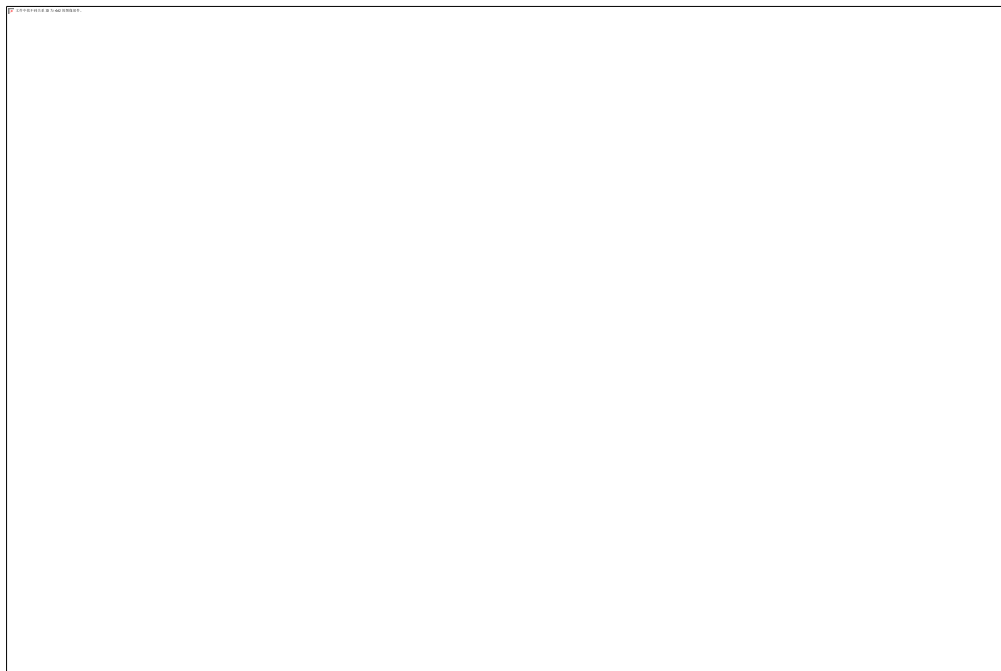


缠绕复合管连续化生产线
Continous production line
for Bamboo winding
composite pipelines



竹缠绕复合管产品





世界首条生物基城市综合管廊试铺成功
First bio-based urban underground common trench

技术创新

技术创新带动了竹藤产业高速发展，2017年，中国竹产业年总产值达2359亿元。竹藤产品出口贸易额19.6亿美元，约占世界66%
Total output of bamboo industry in 2017 – 235 billion yuan . Export of bamboo and rattan product - 1.96 billion USD , 66% of market share

竹藤产业已经成为具有中国特色的绿色朝阳产业
Bamboo industry has been sunrise industry with chinese characteristics

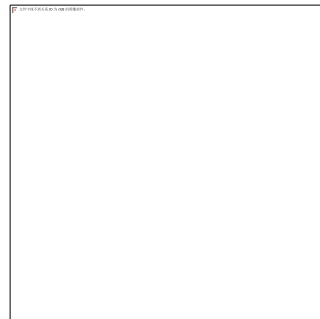
建设国际科技创新联盟，攻克竹藤 重大科技难题

Establishment of International bamboo and rattan Technology Innovation and Industry Development Alliance

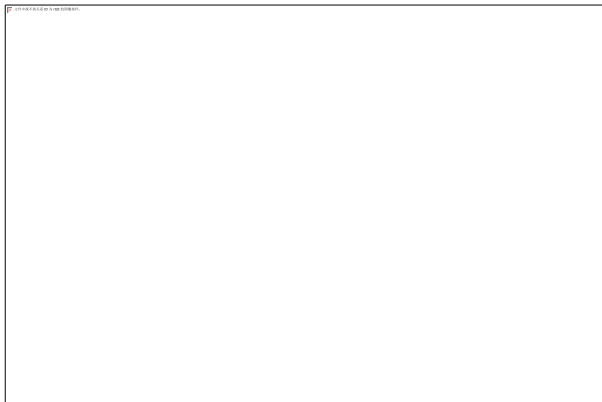
英国剑桥大学、
美国麻省理工学院、
瑞士联邦理工学院
和加拿大英属哥伦
比亚大学等国际一流
高校正在实施开发结
构用竹产品的研究项目。



UNIVERSITY OF
CAMBRIDGE



“国际竹藤科学创新联盟”倡议



与美国林产品研究所签署合作备忘录



与加拿大林产品创新研究院署合作备忘录



与德国哥根廷大学签署谅解备忘录



与荷兰国家自然生物多样性中心签署科技合作协议



江主任率团访问剑桥大学建筑学院并签署了谅解备忘录
University of London School of Architecture memorandum of understanding



江主任率团访问瑞典创新发明研究院并签署了谅解备忘录
Institute of innovation and invention sweden



竹藤产业发展创新驱动联盟合作意向书签字仪式



2014年“竹藤产业发展创新驱动联盟”成立

A wide-angle photograph of a large industrial factory. The ceiling is high and features a complex network of dark metal trusses and beams, with several industrial lights hanging from it. The walls are light-colored and have several windows. In the foreground, there are stacks of long, light-colored bamboo strips on pallets. In the middle ground, there are various pieces of industrial machinery, including a large yellow gantry crane on the right and several processing machines on the left. The overall atmosphere is that of a busy manufacturing facility.

Production line for engineered bamboo



大尺寸胶合竹构件制造及其桥梁建造关键技术
**Key Techniques for Manufacturing Large-scale
Bamboo plywood Components and Bridge
Construction**

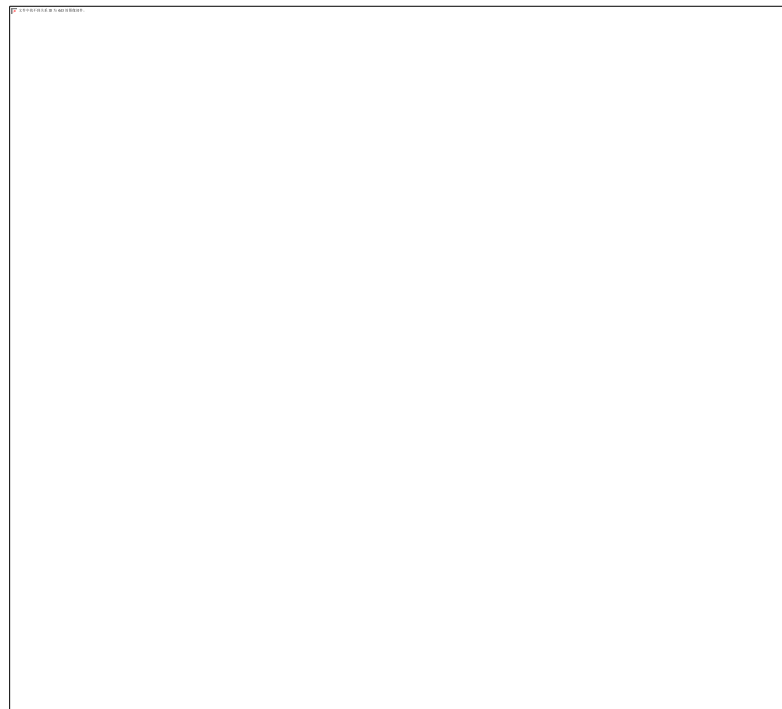
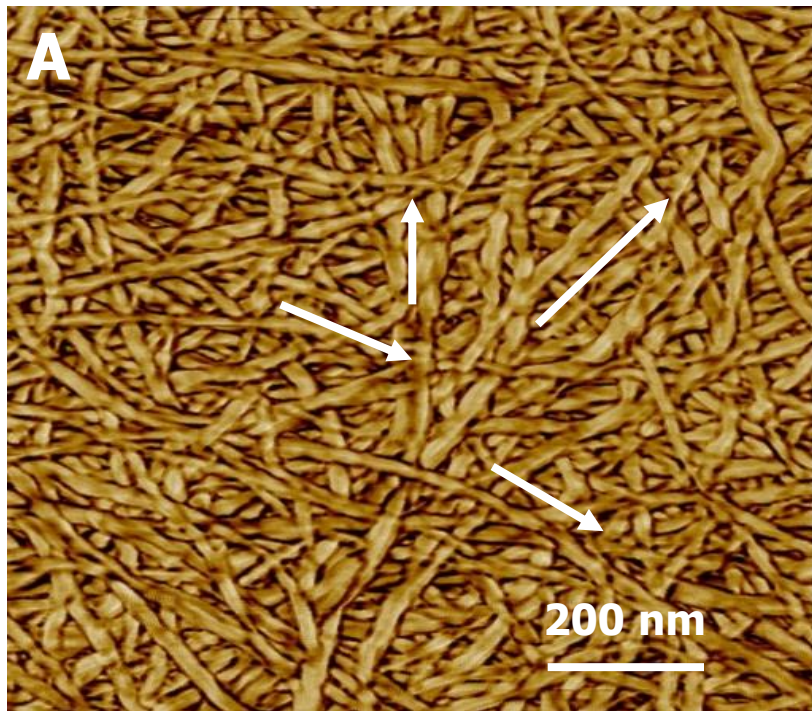
茅以升“小桥工程”竹公益桥 public welfare – bamboo bridge by Mao Yi Sheng

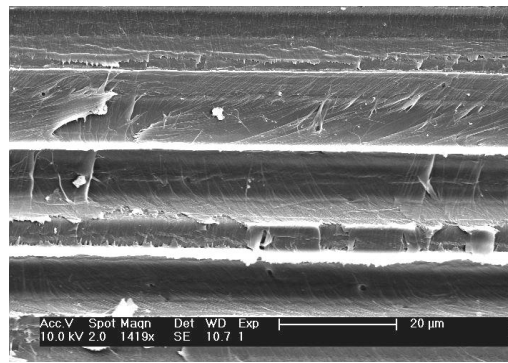
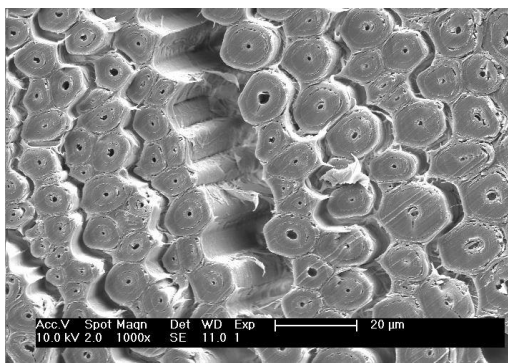
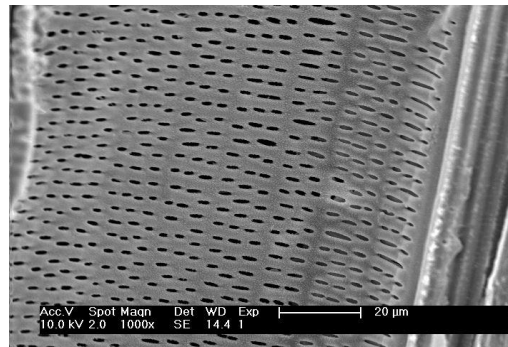
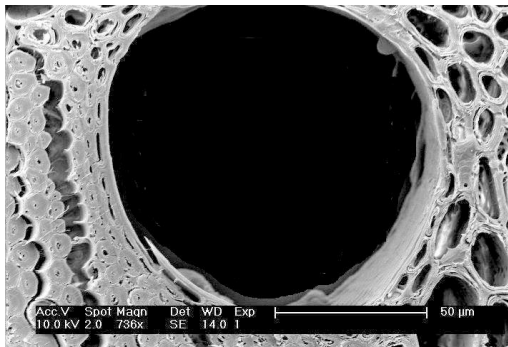
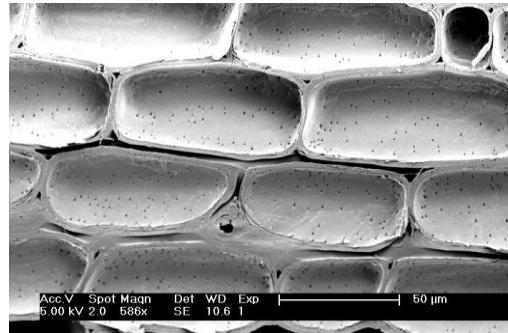
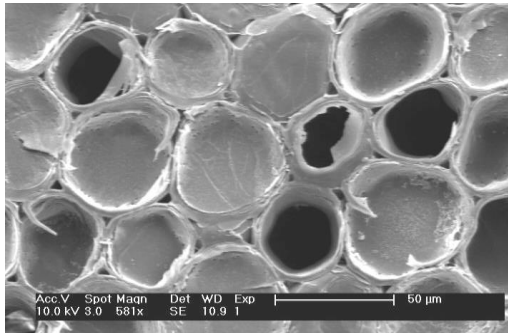


Microfibrillar arrangement in bamboo fiber cell wall.

(Left: primary wall; right: secondary wall)

毛竹纤维细胞壁微纤丝排列（左：初生壁；右：次生壁）





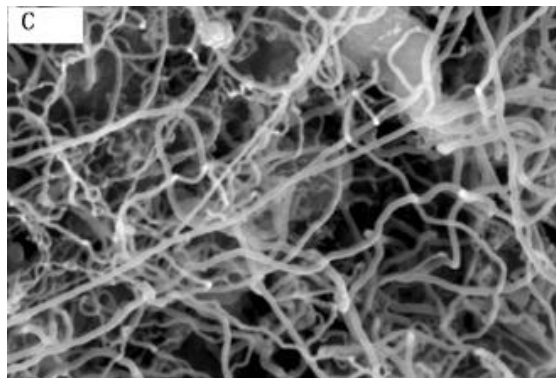
The SEM micrograph
of sound Moso bamboo

Superhydrophobic bamboo

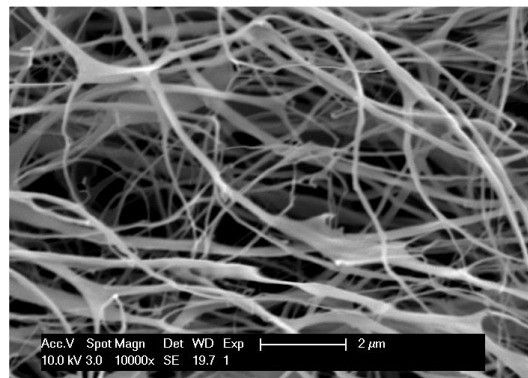
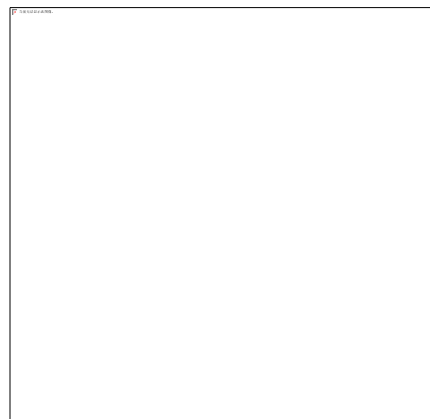
超疏水竹材



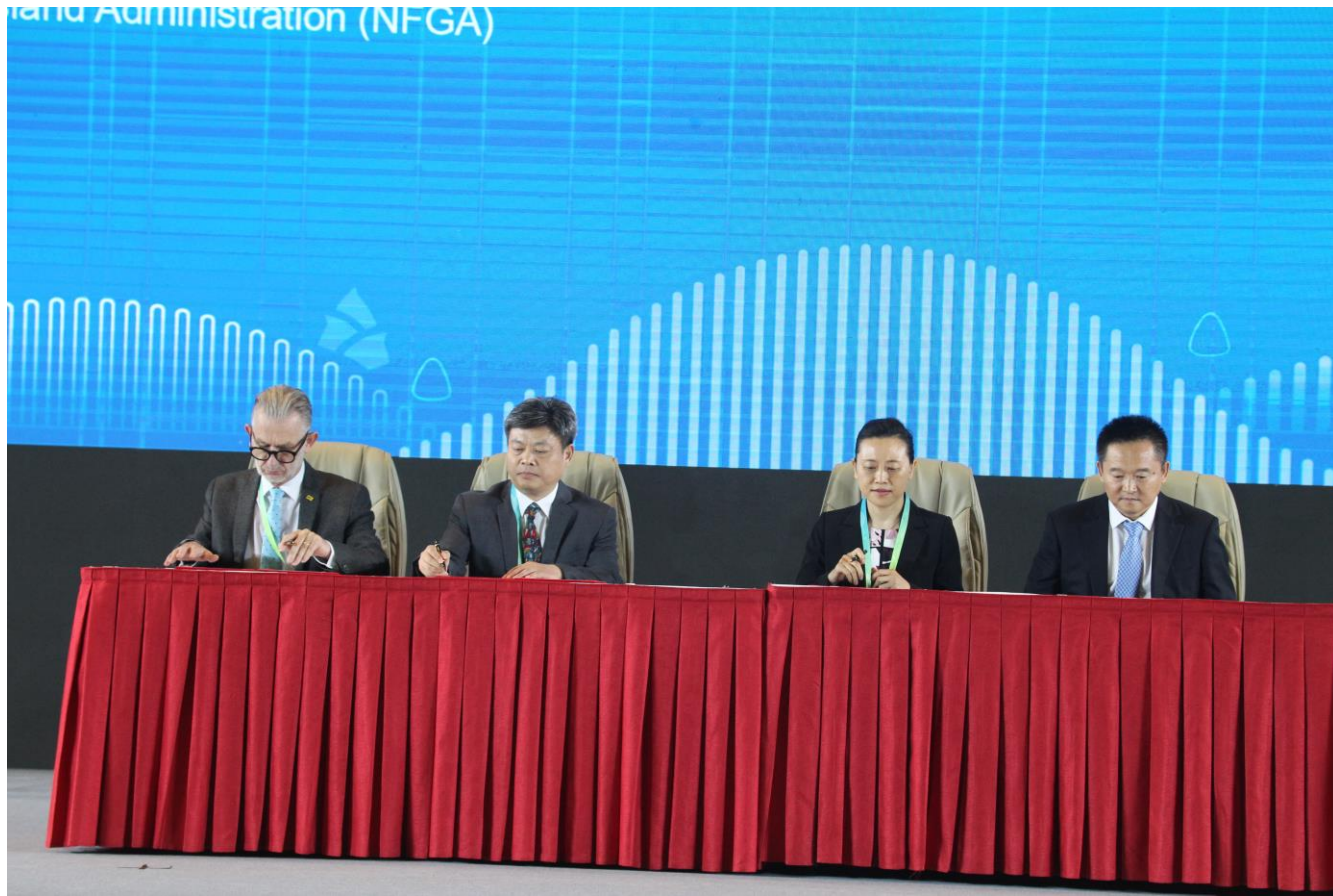
Nanowire network on bamboo surface
竹子表面的纳米线网络结构



Nanocellulose fibers (NCF) produced from bamboo 竹基纳米纤维素纤维



land Administration (NFGA)



“竹藤产业发展创新驱动联盟” 签约照片

Signing ceremony of Technology Innovations in Bamboo and rattan Industry Development



联盟成员：福建和其昌竹业股份有限公司



联盟成员：浙江鑫宙竹基复合材料科技有限公司



联盟成员：四川青神县川南农村社区学院

建立国际标准规范体系，保障竹藤产业可持续发展

中国拥有158项，占各国竹藤标准总量的85%以上。

2015年，国际标准化组织（ISO）

通过决议批准中方提议，

正式成立竹藤技术委员会
(ISO/TC 296)，秘书处设在
中国

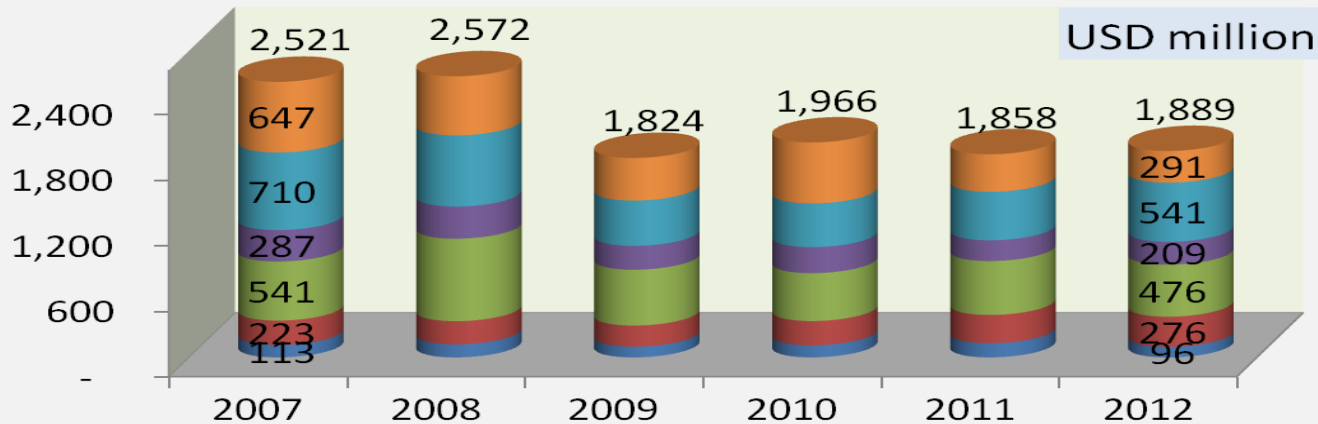


国际标准化组织竹藤技术委员会成立大会

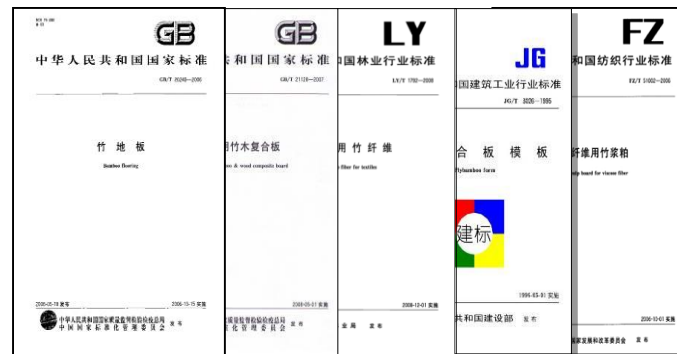
The Launching Ceremony of Bamboo and Rattan Technical Committee
International Organization for Standardization (ISO/TC296)

Hosted by: State Forestry Administration of China (SFA) 主办单位：国家林业局
Standardization Administration of China (SAC) 承办单位：国际竹藤中心
International Center for Bamboo and Rattan (ICRT) 2016

International trade of bamboo & rattan



- Bamboo and rattan raw materials
- Preserved bamboo shoots
- Bamboo woven products
- Rattan woven products
- Industrialized bamboo products
- Bamboo and rattan furniture/seats



THANKS !