Knowledge For Tomorrow's Solutions

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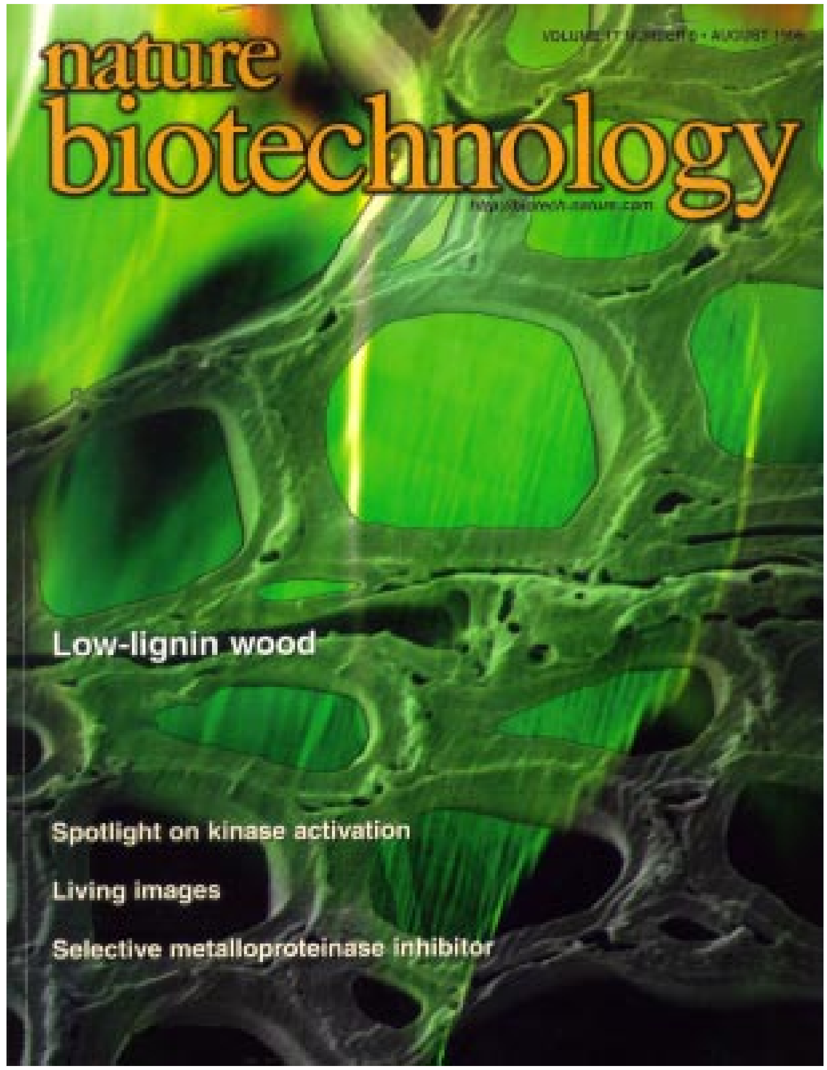
Cover Stories:

Major Scientific Publications Featuring NRI-funded Research

Hu, W-J, S.A. Harding, J. Lung, J.L. Popko, J. Ralph, D.D. Stokks, C-J Tsai, and V.L. Chiang. 1999. Repression of lignin biosynthesis promotes cellulose accumulation and growth in transgenic trees. ***Nature Biotechnology*** *17 (8): 750-751.*



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The development of trees as crops is still in the early stages of development compared to other agricultural plants; most species of trees are still harvested from forests rather than plantations. Although many foresters would argue that tree harvesting helps maintain forest health, intensive management of some land using tree plantations could reduce the percent of forests negatively affected by tree harvesting. Selection of beneficial agricultural traits, as is done with most annual and many perennial crops, requires hundreds or even thousands of generations for trees. The development of fast-growing, low-lignin trees would be both economically and environmentally beneficial, because the removal of lignin is the most costly and environmentally-damaging (due to the chemicals required to strip the lignin) steps of converting wood into materials, such as paper and fuels. However, lignin is essential for tree structural support. Cellulose serves to provide plant cell walls with tensile strength while lignin provides rigidity to the walls. Chiang and colleagues, using NRI funding, showed that inhibition of the 4-coumarate:coenzyme A ligase gene (4CL) in a transgenic aspen resulted in aspens with 45% less lignin than wild species of aspen, but a corresponding 15% increase in cellulose. They also found that leaf, root, and stem growth were enhanced, while structural integrity was maintained in the transgenic aspens. The ability to regulate lignin and cellulose in a compensatory fashion via genetic engineering may lead to increased metabolic flexibility in other more economically important tree species, enabling increased environmentally-friendly wood production at lower costs.

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