

# Plant Yields Secret Of Origins

ITHACA, N.Y. — A weedy, inedible member of the mustard family, related to broccoli and cauliflower, has become the first plant to yield the secrets of its primordial origins.

In a computational research effort at Cornell University, the plant, *Arabidopsis thaliana*, was shown to contain genetic evidence of its emergence between 50 million and 200 million years ago.

The finding, noted Cornell researchers, will be invaluable to those using *Arabidopsis* as a genetic model for other plant species, unlocking genes for important traits in agricultural crops such as corn, tomatoes, and wheat.

The researchers report on their discovery in the latest edition of the journal *Science* (Dec. 15, 2000).

A decade ago, *Arabidopsis* was widely adopted by plant scientists as an easily manipulated model for other plants because it is simple to grow in the laboratory, has a short life cycle and has a small genome — only about 140 million base pairs of DNA compared with wheat, which might have as many as 16 billion pairs. This year, the entire DNA sequence of the plant was completed, and for the first time researchers were able to understand the sequence of the 25,000 genes necessary for an organism to function as a flowering plant.

Using this genome sequence — which is in the public domain on the Internet — the Cornell researchers used computers to sort through the plant's DNA and find its genetic roots.

"We can take the entire genome of one plant and look back at it," said Steven D. Tanksley, the Liberty Hyde Bailey professor of plant breeding at Cornell and an author on the paper. "We are going back into genetic time, and we can see what the ancient genome looked like. If we can understand what the ancestral gene content in one plant is, then we can use that to

learn the gene content in other plants."

Tanksley and the lead researcher, Todd Vision, a Cornell visiting scientist, explained that for many plant genomes there is a lot of empty material between the proteins. Tanksley suggested that understanding a genome is like driving along a highway. On the East Coast, you do not have to drive far before you reach another city, while out west, there are long distances between cities.

The point of the analogy is that scientists can gather more general genetic information from *Arabidopsis* in a shorter period of time. Said Tanksley, "*Arabidopsis* is the East Coast of DNA sequencing."

The researchers used a computer program called BLAST to classify the thousands of genes in *Arabidopsis* into gene families. BLAST (an acronym for Basic Local Alignment Search Tool) is a sequence similarity program designed to support analysis of nucleotide and protein databases. It was developed at the National Center for Biotechnology Information, part of the National Institutes of Health, in Bethesda, Md. The researchers then used novel algorithms to find large chunks of the chromosomes that were duplicated long ago.

In the process of duplication, all the genetic material in a species doubles, creating what is known as a polyploid. The researchers inferred that *Arabidopsis* was an ancient polyploid because it contained evidence of multiple duplications.

Although duplicated chromosomes diverged from one another and became scrambled over the eons, the research team was able to find 103 duplicated chromosome segments that ranged in age from 50 million to 200 million years. "We figured out where gene family members are located and used that information to find the ancient duplicated segments," said Vision, who is a molecular biologist at

the Center for Agricultural Bioinformatics (CAB) at Cornell. The CAB is supported by the USDA Agricultural Research Service in partnership with the College of Agriculture and Life Sciences and the Theory Center at Cornell.

With help from the dating estimates obtained by paleobotanists, the team was able to look at the duplicated gene sequences and deduce when the genome duplications in *Arabidopsis* occurred. The team found that a

few large duplication events were responsible for the pattern they saw.

"Our work was entirely computational, but a lot of other researchers' laboratory work went into it before that," said Vision. He draws an analogy between finding prehistoric genetic relationships and the development of language.

Many words in Romance languages such as Spanish, Italian, French, and Portuguese are derived from Latin. "We can see the roots of the modern words as being derived from Latin," he said. "In our case, we are find-

ing the genetic roots of the genes before they duplicated and diverged."

The paper, "The Origins of Genomic Duplications in *Arabidopsis*," was authored by Vision, Tanksley, and Daniel G. Brown of the Whitehead Institute at the Massachusetts Institute of Technology. Brown participated in the research while completing his doctoral degree, which he earned from the Department of Computer Science at Cornell last spring. The research was funded by the USDA Agriculture Research Service and grants from the National Science Foundation and the Office of Naval Research.

## International Agrimarketing Center To Host Food Show Jan. 8

DOYLESTOWN (Bucks Co.) — Food companies in the Delaware Valley have an extraordinary opportunity to sell their products overseas during a one-time international food show Monday, Jan. 8 from 8 a.m. to noon at Meiji-En Restaurant, Philadelphia.

More than 25 serious overseas buyers will visit the show with the expressed goal of buying U.S. food products. These buyers are from France, Belgium, Holland, Hungary, Indonesia, Israel, Russia, Thailand, Korea, Singapore, Hong Kong, Egypt, the Czech Republic, Italy, Vietnam, Saudi Arabia and the United Arab Emirates.

They are seeking to purchase beef, pork, veal, lamb, poultry, seafood, deli products, cheeses, grocery products, beverages,

cakes, cookies, candy and condiments, among other commodities.

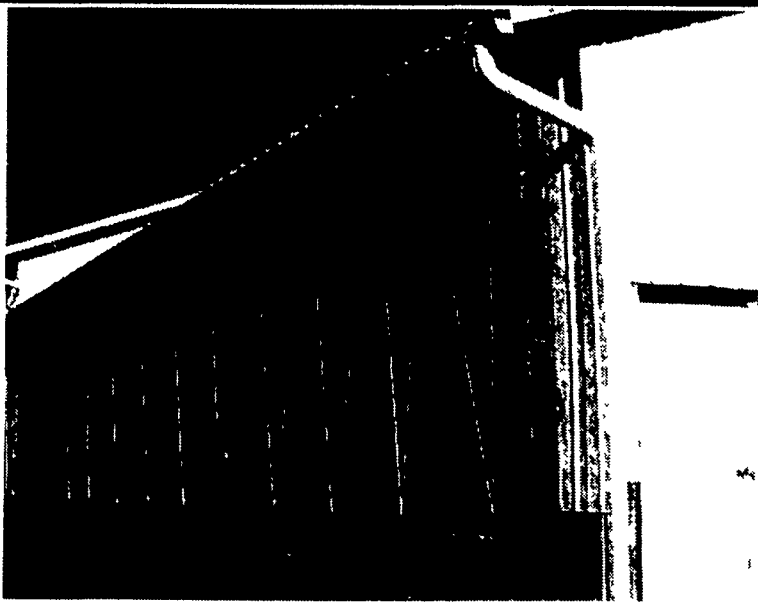
Following the International Food Show, a seminar will be offered featuring August "Gus" Schumacher, under secretary of agriculture for USDA; Jim Cuorato, director of commerce for Philadelphia; and Jim Kenney, Philadelphia city councilman-at-large. At the conclusion of the seminar, the group will travel to Doylestown, where they will tour Delaware Valley College. Delaware Valley College is noted nationally as a leader in agricultural education.

Founded in 1896, the college is a comprehensive four-year institution of higher learning with nearly 1,400 men and women enrolled full-time in more than 35 academic programs, ranging from agribusiness, agricultural,

biological and physical sciences, to business administration, computer information systems, English and secondary education. In addition, 700 students are enrolled on a part-time basis in DelVal's Continuing Education program, working to advance their careers.

The International Food Show is sponsored through a collaboration of the Pennsylvania Department of Agriculture, Food Export USA-Northeast, The Delaware River Port Authority and the International Agrimarketing Center of Delaware Valley College.

For more information, call Ron Davis, international consultant at Bell Exports, at (215) 829-9090, or Jim Diamond, Dr. James E. Diamond, co-director of the International Agrimarketing Center of Delaware Valley College at (215) 489-2400.



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