

FANTASTIC DISCOVERIES IN

PBCC

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# PLANT BREEDING

**BARLEY** has taught us genetics for 50 years  
*and it's just getting started!*

$$\Delta G = \frac{h^2 \sigma_p^2}{L}$$

**ONE  
POPULATION  
INFINITE  
LESSONS!**

From K-12 classrooms to high-tech genomics labs,  
**OREGON WOLFE BARLEY**  
bridges classical genetics and modern crop science, all from a  
*single bag of seed!*

**SEE INSIDE FOR DETAILS**

## THE SCIENCE

How do you make genetics come alive for students when most **traits** aren't obvious or even visible to the naked eye? More than 50 years ago, a barley breeder at Agriculture Canada found an answer. Working before the age of genomic sequencing or even molecular markers, Dr. Bob Wolfe painstakingly bred two contrasting barley lines, one carrying all **dominant** alleles and the other carrying all **recessive** alleles for more than a dozen genes that control clearly visible traits. Crossing the two lines to one another produced what is now known as **Oregon Wolfe Barley\***, an astounding population in which the fundamental principles of heredity bloom before your eyes. Hooded florets (left front image) versus awned florets (right), six-row versus two-row grain heads, black versus yellow seed, and more -- each trait controlled by well characterized genes, and (more importantly) each clearly visible to any student willing to look.

## THE IMPACT

The visionary Oregon Wolfe Barley population enabled construction of the first physical map of the **barley genome** and has contributed to over 50 peer-reviewed publications. In the United States, the **iTAG (Inheritance of Traits and Genes) curriculum**, a hands-on educational program built around Oregon Wolfe Barley, has reached more than 5,000 students in grades 7-12. In addition, the population is widely used in universities, not only in the United States but internationally in Germany, Italy, Norway, and Spain. For educators, seed is available from Oregon State University; and the iTAG curriculum is also **freely available** online in both English and Spanish. Oregon Wolfe Barley seed is deposited with the USDA-ARS **National Center for Genetic Resources Preservation** and backed up in the Svalbard Global Seed Vault, ensuring this valuable resource endures for generations.

## DID YOU KNOW?

The **"hooded" barley phenotype** -- where an extra flower grows in place of an awn (see left front image) -- is caused by a single 305-basepair DNA duplication. After growing the plants from seed, students can observe the trait and confirm the causative mutation with a PCR reaction, all in one lab session. Oregon Wolfe Barley plants also elegantly demonstrate **epistasis**. For example, the hooded trait is completely masked when a second gene (LKS2) is recessive -- a perfect, living illustration of how genes interact with each other.

## THE TEAM



The Oregon State Small Grains Breeding Team, left to right: Scott Fisk, Dr. Margaret Krause, Dr. Patrick Hayes, and Laura Helgerson. Inset: Dr. Bob Wolfe