



**New Directions and Changing
Faces for the USDA Sunflower
Genetics Research Programs**

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Research Geneticist**

Brent's background

- Grew up on dairy farm in southern MN
- Agronomy BS from South Dakota State
- Plant Breeding MS from Iowa State
- Plant Breeding / Molecular Genetics PhD from Univ. of Minnesota, St. Paul

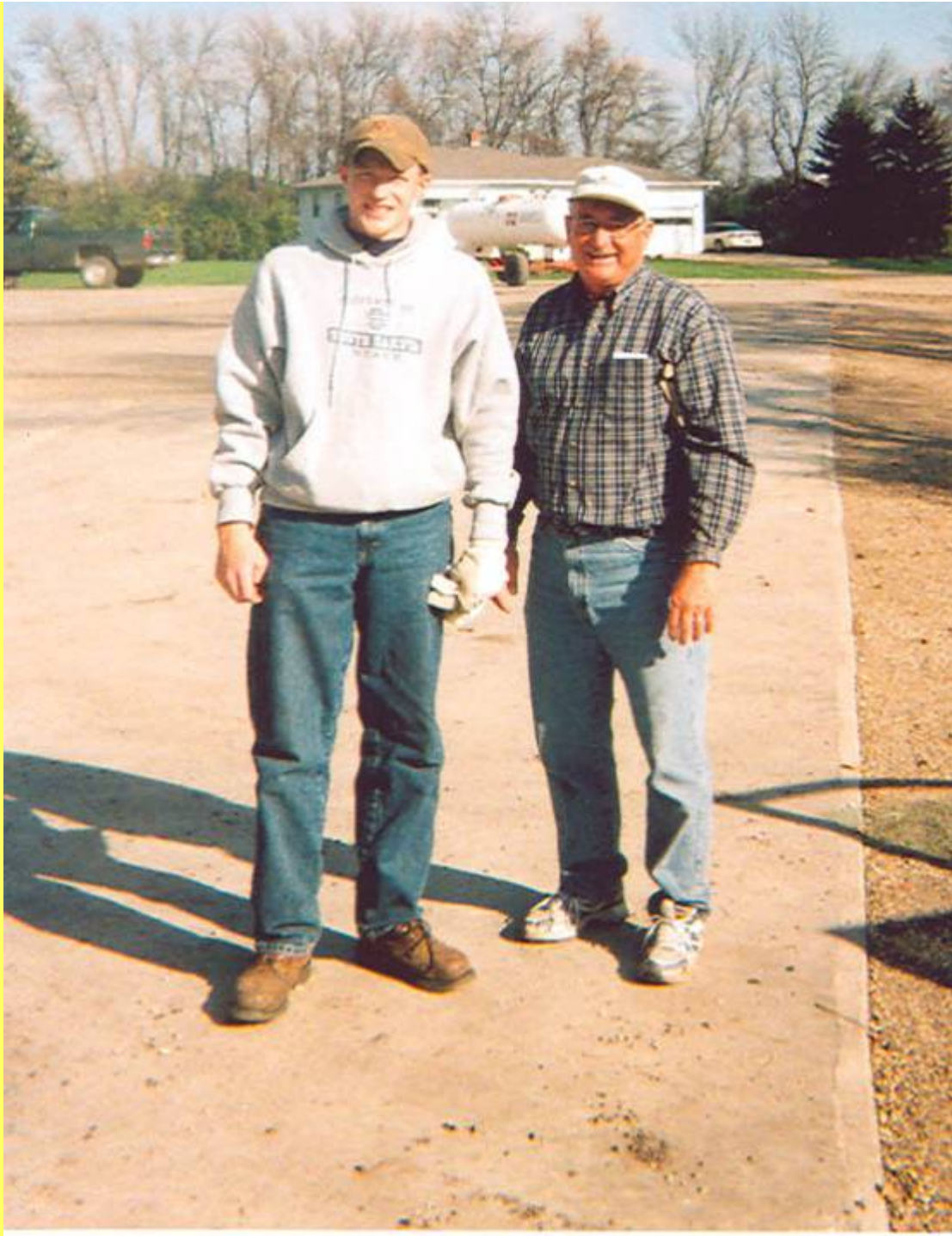
Timeline

- May 2004 – Brent begins PhD program at Univ. of Minnesota in minor crops genetics
 - Begin work on interspecies crosses in sunflower
 - Meet and begin collaborations with Jerry Miller
- January 2007-- Jerry Miller and Dale Rehder retired



Timeline

- January – early September – “empty lab”
- May 2007 – interviews for Jerry’s replacement
- September 2007 – Brent finishes PhD and fills the empty lab
- January 2008 – replacement for Dale has been found! – Dana Weiskopf



What will change in the genetics program?

- In addition to line development, we will become involved with marker assisted selection
 - Goal: To ‘bundle’ new lines with molecular and phenotypic data for commercial breeders
 - Work side-by-side with our Molecular Geneticist (Dr. Hu)
 - Merging quantitative genetics with molecular genetics technologies – an opportunity to advance the science

Research goals for the next year

- Disease resistance
 - Backcross marker assisted selection for Sclerotinia Head Rot
 - Convert a resistant oilseed line into a resistant confection line using Dr. Hu's markers
 - Broad Goal: To determine if marker assisted selection can speed up backcrossing for genetically-complex traits
 - Producer-relevant Goal: To improve the Sclerotinia resistance in confection types



Research goals for the next year

- Work with new sources of Sclerotinia resistance
 - Continued screening of PIs by Tom Gulya
 - Genetic evaluation of PIs using classical and molecular tools
 - Broad Goal: To understand, to the extent possible, the type, number, and structure of new resistance genes
 - Producer-relevant Goal: To produce resistant lines with marker “tags”, which make it easier for the seed industry to use

Research goals for the next year

- Use data from last year's field season to make some improvements in Phomopsis resistance
- Data collected with assistance from Tom Gulya
- Variation existed in our lines



Research goals for the next year

- Insects
 - 4 populations selected for resistance to stem weevil, red sunflower seed weevil, banded moth, sunflower moth
 - Take data from previous two years to make a new “cycle” of populations – combine the best with the best

History of the Insect-Resistant Recurrent Selection Populations

1/4/2007

Year	Sunflower Moth	BSM	RSSW	Stem Weevil
1987		Brewer et al PI observations	Brewer et al PI observations	
1988		Seed from 1987 plots grown in Fargo, single heads self pollinated	Seed from 1987 plots grown in Fargo, single heads self pollinated	
1989		√	√	
1990		√	√	
1991		√	√	
1992		Selfed progeny of three plants from 1988 random mated	Selfed progeny of three plants from 1988 random mated	
1993		Progeny from 1992 & HA 821 emasculated and crossed with pollen bulk of 3 original lines + plants from new PIs	Progeny from 1992 & HA 821 emasculated and crossed with pollen bulk of 3 original lines + plants from new PIs + different selfed progeny from 1988 nursery	
1994		F2 populations selfed	F2 populations selfed	
1995		√	√	
1996		Random mated lines derived from selected selfed plants of 1994	√	
1997		F2 populations selfed	√	
1998		√	F3 = S1 lines selfed	
1999		√	√	
2000		√	√	
2001		F3 = S1 populations selfed	√	
2002		√	F4 = S2 lines selfed	
2003		F4 = S2 populations selfed	F5 = S3 lines selfed	
2004	Pollen bulk of F5 lines from BSM population and new interspecific lines crossed to emasculated HA 445	Pollen bulk of F5 lines and new PIs and interspecific lines crossed to emasculated HA 445	F6 line pollen bulk crossed to emasculated HA 445	Pollen bulk of resistant PIs and interspecific lines crossed to emasculated HA 445
2005	H			
2005	F1 bulk population selfed	F1 bulk population selfed	F1 bulk population selfed	F1 bulk population selfed
2005	F2 = S0 population selfed	F2 = S0 population selfed	F2 = S0 population selfed	F2 = S0 population selfed
2006	S0:1 lines evaluated	S0:1 lines evaluated	S0:1 lines evaluated	S0:1 lines evaluated
2007	S0:1 lines evaluated	S0:1 lines evaluated	S0:1 lines evaluated	S0:1 lines evaluated

Research goals for the next year

- Insects
 - Additional “two-parent” crosses were made and lines are being tested
 - Assistance of a “post-doc” to better approach the insect problems of the central plains
 - Merging Genetics and Entomology



Research Goals for the next year

- Agronomics
 - Oil yield – can we move upward?
 - Learn more about confection sunflower – what kind of variation is available?



Other (unseen) changes

- Lab upgrades
 - Improvement of computing power and capacity
 - Use of handheld data collectors to collect and analyze data quickly, even in the field
 - Use databases to combine molecular with phenotypic data, for sake of convenience and data security
 - Using a server system to backup files in a different building

Other (unseen) changes

- Greenhouse upgrades (upcoming)
 - 30' X 100' greenhouse will be upgraded with drip irrigation/fertigation, and winter ventilation
 - Goal: to improve the versatility and usefulness of the greenhouse over the winter season, as well as use water and fertilizer resources more efficiently



Concluding remarks

- My goal is to use genetics to solve production problems
- More than one method is necessary – every problem is different
- Collaborations with other scientists are necessary and helpful
- There is no need to do science for the sake of science – there is plenty to do!

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