

# Dedication: Fredrick A. Bliss

## Teacher, Researcher, and Director of Plant Breeding

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Fred Bliss has always maintained an abiding appreciation for diversity. This is a valuable asset, especially for a plant breeder, because genetic diversity is so important for crop improvement. In Fred's case, this appreciation of diversity has extended to many other aspects of his career, and undoubtedly contributed to the tremendous success he enjoyed. In fact, this appreciation of diversity probably under-pinned his decision to assume very different roles during his nearly 40-year career, including teacher and researcher at two land grant universities, chair of a university department, and research administrator at a major vegetable seed company. In each role, Fred maintained a broad interest in plant breeding, applying his talents to a wide range of crop species and research topics, and utilizing a variety of technical approaches. His ability to work with many different people and to integrate diverse ideas and approaches were essential elements to his success. All of these assets contributed to a career marked by important scientific discoveries, excellent student training, and valuable guidance on national and international issues.

## EARLY YEARS

Fred was born in 1938 and raised on a farm near Red Cloud, Nebraska. His interest in agriculture began at an early age, and as a youngster he learned the methods of farming and skills required to manage a farm enterprise. In 1956, he entered the University of Nebraska–Lincoln as an undergraduate in engineering but soon changed his major to agronomy. Although this background as an agronomist from the heart of Nebraska would later create some suspicion among his horticultural colleagues, the education he received at U.N.–Lincoln provided a solid foundation for his future career in the plant sciences. Fred received the B.S. degree from U.N.–Lincoln in 1960 and entered graduate school the same year at the University of Wisconsin–Madison, studying under one of the leading horticultural plant breeders of the time, Warren H. Gabelman. His thesis research focused on cytoplasmic-genic male sterility in table beets, a trait still used today for development of commercial  $F_1$  hybrids. This graduate study experience at Wisconsin played an important role in Fred's professional career, and he has maintained a life-long personal and professional association with Professor Gabelman. After receiving the Ph.D. degree in Horticulture–Genetics, Fred was awarded an NIH Postdoctoral Fellowship to study at the University of Minnesota, where he spent a year on the St. Paul campus working with Charles Gates and Ralph Comstock on computer simulation of selection in self-pollinated crops.

By the 1960s, the University of Wisconsin–Madison had developed an outstanding program in plant breeding. This program was strengthened even further in 1966, by the hiring of the young, talented Fred Bliss, as an Assistant Professor. His appointment was in the Department of Horticulture, and his research focus was on breeding self-pollinated crops, especially common bean, *Phaseolus vulgaris*. However, before settling into academic life in Madison, Fred took an overseas assignment as a member of a U.W.-USAID team stationed at the University of Ife in Western Nigeria. This would prove to be an important experience. Here, Fred saw firsthand the pervasive problems and challenges facing researchers in developing countries. That experience kindled an interest in working to solve some of those problems, and provided a research focus for much of his career. He also gained an appreciation for the difficulties one faces adapting to a foreign culture, which he would later use to help the students from foreign countries who trained with him.

After completing a two-year assignment in Nigeria, Fred and the family went to the University of Goettingen in West Germany in 1968 where he stayed for six months as a visiting scientist working with Gerhard

Robbeline. His research topic was a bit before its time: Development of *Arabidopsis thaliana* as a model system for studying quantitative expression. While in Europe, he traveled to Cambridge University to visit John Thoday, who introduced Fred to recent work showing that single genetic factors contributed to quantitative variation. This stimulated his interest in the genetic control of quantitative expression, which Fred would later explore in his research on common bean.

Upon returning to Madison in 1969, Fred became immersed in campus life, initiating a research program in breeding self-pollinated crops and a teaching program for graduate and undergraduate students. With Warren (Buck) Gabelman, he co-instructed the introductory plant breeding course and taught a course on vegetable production. He became an important contributor to the newly created graduate program in Plant Breeding and Plant Genetics, and soon was a popular member of many graduate student committees. Although his research would focus on *Phaseolus vulgaris*, it would also encompass a wide range of topics and many different approaches, from traditional hybridization and selection procedures to implementation of new methods, such as rocket immunoelectrophoresis to quantify protein and development of inbred back-cross lines to identify loci contributing to quantitative trait expression. This program provided training for scientists from all parts of the world.

## **BREEDING PROGRAMS AT THE UNIVERSITY OF WISCONSIN**

The faculty breeding position at U.W.–Madison was initiated, in part, to support a snap bean production industry that was expanding in the central sands area of Wisconsin. Fred's research helped advance this industry through development of breeding methods for self-pollinated crops and improved bean germplasm. Initially, this effort was focused on resistance to important diseases, such as root rot caused by *Rhizoctonia*, *Pythium* and *Phytophthora*, halo blight, and bacterial brown spot, and on improvement of pod quality. Later, his work on biological nitrogen fixation would be applied to snap bean production in Wisconsin, as well as dry bean production elsewhere in the world. Many people contributed to this effort, key among whom was Ken Kmiecik, who also participated in many other projects conducted by Fred and his students, post-doctorals, and visiting scholars.

Another notable area of research involved improvement of dry edible beans for traits important in developing countries, such as nutritional quality and reduced production inputs. This interest began with his

earlier work in Nigeria and led not only to practical innovations but also to pioneering work on genetic control of seed protein accumulation and biological nitrogen fixation. The seed protein work benefited from close collaboration with Timothy Hall in the Department of Horticulture; with their students and post docs, they created a comprehensive body of knowledge on the physiology, genetics and molecular biology of bean seed proteins. Fred's research on nitrogen fixation was the first to utilize genetic variation for this trait in *Phaseolus vulgaris* to improve efficiency of nitrogen fixation through breeding. The nitrogen fixation work benefited from collaborations with Winston Brill and Robert Burris, also at the University of Wisconsin. Researchers in Brazil and at the International Center for Tropical Agriculture (CIAT) in Colombia played important roles in applying the findings from these studies to regions of the world where they could have the most impact. Fred's association with Dermot Coyne on the Bean-Cowpea CRSP also was an influential factor in the success of these projects, and this collaboration was part of a life-long association with Dermot.

One theme that has persisted throughout Fred's research is the importance of identifying sources of useful genetic variation and developing efficient ways to utilize those resources for crop plant improvement. While working to improve *Phaseolus*, he realized that development of inbred backcross lines was an efficient method for introgressing genes controlling quantitative traits, and demonstrated the utility of this approach in several projects. He also was an early innovator in the use of molecular methods for studying genetic variation. The contributions of Fred's research group on seed protein variation in cultivated and wild beans led to important insight about domestication of *Phaseolus vulgaris* and the discovery and utilization of arcelin seed protein as a mechanism that confers insect resistance. Again, collaboration with other scientists, such as entomologists Caesar Cardona and Art Van-Schoonhoven at CIAT, was key to success in these projects.

## UNIVERSITY OF CALIFORNIA, DAVIS

In 1988, Fred was offered and accepted the first Will W. Lester Endowed Chair in the Department of Pomology at the University of California in Davis. The move to California represented a huge transition in research focus, and is a testament to his ability to adapt to and thrive in diverse environments. For the next ten years, he led collaborative genetic and breeding research on tree fruits, initiating a rootstock breeding program that continues at present, and developing molecular tools for genetic and

breeding applications in stone fruits (peach and almonds). At U.C.–Davis, he served as chair of the Plant Biology Graduate Program from 1990 to 1992 and chair of the Department of Pomology from 1991 to 1994. This was a difficult time to be an administrator. The weak California economy had forced budget and personnel reductions, and Fred provided much-needed leadership during this tough period of downsizing. In 1995, he established the Laboratory for Genetic Identification and directed that facility until 1998 when he became Professor Emeritus at U.C.–Davis.

### **SEMINIS VEGETABLE SEEDS**

The next transition in Fred's career was perhaps the most challenging, but also one of the most rewarding. In 1998, he accepted the position of Director of Worldwide Plant Breeding for Seminis Vegetable Seeds, Inc., in Woodland, California. Seminis had been formed through the merger of several smaller seed companies, and one of Fred's primary responsibilities was to integrate the 100+ different breeding programs into a cohesive strategy for developing new vegetable cultivars. He managed this diverse group of plant breeders located at research stations throughout the world with seven associate directors who reported directly to him. In 1990, Fred was part of a small senior management team that provided leadership in optimizing activities of the Research and Development Division of Seminis. When that group completed work, he assumed responsibility as Senior Director of Support Technology, which included areas of cell biology, molecular markers and applied genomics, pathology, vegetable quality, and foundation seed. In December 2003, Fred began a reduced-time appointment with responsibility for special projects, a position he currently holds.

### **ACCOMPLISHMENTS**

Throughout his career, Fred has provided his knowledge and expertise in the service of various research and professional organizations. He was a member of international review teams that evaluated research programs at EMBRAPA, CIAT, USAID, and FAO. His service to national organizations included membership on committees and review panels at USDA/NRI, USDA/ARS, NRC/NAS, and the U.S. National Plant Genetic Resources Program. Fred has held important posts in professional organizations, including Chair of the Strategic Planning Committee,

Vice President–Research, and President and Chairman of the Board of Directors of the American Society for Horticultural Science (ASHS). He served the Pomology Society as member of the Wilder Committee, and the Crop Science Society of America (CSSA) as a member of several committees. Fred’s editorial skills were widely recognized and put to good use as Associate Editor of the Journal and Chair of the Publication Committee for ASHS, and as Scientific Editor for the Kluwer book series on Biotechnology in Agriculture.

Fred has received many awards for his professional accomplishments, including Outstanding Graduate Educator, the Asgrow Award and B.Y. Morrison Memorial Lectureship from the ASHS, and the Meritorious Service Award from the Bean Improvement Cooperative. In 1986 he was awarded the ASSINSEL Grand Prize from the International Association of Plant Breeders for the Protection of Plant Varieties. Fred was elected as a Fellow of the ASHS in 1985, the CSSA in 1986, and the American Association for the Advancement of Science in 1990. He was also presented with many consulting opportunities throughout his career. Receiving the Master’s Week Alumni Award from his alma mater, the University of Nebraska–Lincoln, in 1987 was especially appreciated.

One of the greatest professional and personal rewards for Fred has come from the many interactions he enjoyed with students and colleagues. I believe that these interactions have been even more rewarding for those of us who had the pleasure to work with Fred. Fred’s mentoring skills were highly appreciated by his students (and recognized by many who wish they had been his students!). He always provided excellent ideas and boundaries for thesis research, but he also gave plenty of room and encouragement for students to explore their own ideas. One of his proudest achievements is that nearly every student who began a degree program with him finished their degree with him. His colleagues also greatly enjoyed their interactions with Fred, and they frequently comment on this in mentioning their association with him. In a research environment that can often be extremely competitive, Fred is a shining example of how it is possible to do good science and be a good person.

While Fred’s many attributes can be mentioned only briefly in this short dedication, one that deserves special attention is his ability to see the larger picture and to integrate pieces of a complex problem. This is evident from the many different lines of research that he undertook during his career, and from his multifaceted approach to research problems. Fred was always comfortable incorporating new research techniques, such as those involving new physiology or molecular biology methods; and he encouraged collaboration among scientists from different disciplines. One example of his integrative skills that is particularly vivid to

me involved the discovery of arcelin seed protein as the factor conferring resistance to seed-boring bruchid insects. A group of students (including myself) had discovered this unusual seed protein in some accessions of wild beans, but our interest did not go further until Fred recognized that the same accessions also had been listed as highly resistant to bruchids in a CIAT report. This observation, and Fred's connection to scientists that were eager to collaborate with him, led to a series of experiments that revealed a very interesting evolutionary history for arcelin and a practical solution for developing regions of the world that suffer from the devastation caused by this insect pest. I am sure that every student and colleague who worked with Fred has similar stories.

I would be remiss not to point out that Fred has always led a balanced lifestyle and that his family and friends have played important roles in helping maintain this balance. He raised three sons and enjoyed many activities with them while they were growing up, including coaching soccer. Today, Fred and his wife Mary live in Davis, California, where they enjoy travel, antiquing, walking, art collecting, and each other. They also enjoy visiting the families of their five grown children, including five grand children. Fred is still very active in the plant breeding world, and he continues to participate in diverse activities related to this profession. He is always thrilled to see former students and colleagues, and to meet new ones. Those of you who know him undoubtedly look forward to these connections. I encourage those of you who have not met Fred to seek out his wealth of knowledge and wisdom.

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