Donald Wayne Bailey 1926–2010

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The development of entire fields of science has often been significantly modified and advanced by the breakthrough ideas of individuals with exceptional vision and foresight. Those with the capacity to translate their original insights into novel workable tools provide a starting point for dozens and even hundreds of scientists to exploit areas that had not previously been accessible to investigation. This eventually results in speedy and broad advances that yield quantitative and qualitative leaps in general knowledge.

Donald Wayne Bailey was one of those men whose foresight and originality of thought profoundly influenced and changed the study of mouse genetics for decades. After completing high school at the age of 17, Don enlisted in the US Army and saw combat in France during World War II.

Following his return to the United States in 1946, he entered the University of California in Berkeley, where he obtained a Ph.D. in genetics; he then spent 4.5 years as a postdoctoral fellow at The Jackson Laboratory. After holding subsequent positions at the University of Kansas, the National Institutes of Health, and the University of California at San Francisco, he returned to The Jackson Laboratory as a staff scientist. He subsequently became senior staff scientist and served 2 years as the interim director.

To properly evaluate Dr. Bailey's contribution, we have to refer back to the not-so-distant past before the genomic sequence was established, before single nucleotide polymorphisms (SNP), and before microsatellite markers, when the search for linkage depended on a very limited number of physiological mutations and on biochemical markers, each of which required a different method for genotyping. The mapping had been laborious and expensive even for single-gene mutations with very large effects, and the quantitative trait loci (QTL) had been entirely beyond the reach of any analysis.

The development of the recombinant inbred (RI) strains (Bailey 1971) was the most significant breakthrough in that situation, and it is widely recognized as being Don Bailey's first major contribution. The advantages of the RI strains quickly became obvious: a permanent population with a fixed pattern of segregated genes helped avoid the breeding of mapping crosses for each linkage experiment separately; the permanent and cumulative genotype data of the RI sets obviated the need for genotyping of linkage crosses in each

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experiment; and the distribution and degree of expression of the phenotype of interest in individual RI strains provided an insight into the likely genetic architecture of its control. Not surprisingly, the RI system became vastly popular, and the production of numerous sets of RI strains from different pairs of parental strains spread with remarkable speed through the scientific community. In fact, a very significant proportion of linkage data worldwide has been obtained using the RI strains.

It is with hindsight that the significance and impact of the concept underlying the RI strains are even more appreciated. As well as the obvious advantages of the use of RI strains, we may be in awe of the remarkable elegance, effectivity, and originality of the concept of permanent segregating populations that was developed by Don Bailey. Its general genetic effectiveness has been confirmed by its further specialized applications in recombinant congenic strains, chromosome substitution (consomic) strains, and the emerging heterogeneous RI strains. Clearly, Bailey's ideas continue to substantially affect the way we are currently studying genetics.

Don's second major contribution was the development of an effective method of orthotopic tail skin transplants in mice (Bailey and Usama 1960), which demonstrated that when applied to progeny of irradiated or nonirradiated mice, it could detect mutations in histocompatibility genes (Bailey and Kohn 1965). Those who remember the cumbersome and time-consuming method of skin grafting on the flanks of mice that was the standard at that time readily appreciate the ease and speed of Bailey's method. It has proven ideal for the testing of the genetic purity of mouse strains, but its main impact has resided in its use for the detection of spontaneous and induced mutations in the major histocompatibility complex. This application resulted in the production of a series of mutant haplotypes that were instrumental in defining the role of domains of MHC class I molecules in the presentation of antigens to T lymphocytes. Undoubtedly, without the method introduced by Don Bailey, this development would have been significantly delayed. The data from these studies are an essential part of our present understanding of the development and molecular basis of the antigen specificity of T lymphocytes.

Don's third important contribution was his genetic dissection of the control of polymorphism of bone shape

(Bailey 1986a, b). With the acuity and scientific rigor that deserve the full admiration of those presently involved in the genetics of quantitative trait loci, he presented a comprehensive and efficient dissection of the set of quantitative phenotypes controlled by independent genes.

It is striking that this work, performed before the availability of microsatellite and SNP markers, contains all the major constituents of an elegant QTL study. The work specified novel insights into morphogenesis (Bailey 1986a).

This brief account, however, in no way exhausts Don Bailey's contributions to the field nor does it describe his warm personality. He believed in scientific creativity, and demonstrated that the results of a creative undertaking could benefit a broad community.

When reviewing the work performed by numerous groups since the 1980s, it is obvious that, in the strict sense of word, it would not be possible without the foundations laid by Don Bailey. His attitude of interest and enjoyment in human contacts formed the basis of many warm and long-standing friendships. As well as being a formidable thinker and a scientist who fundamentally changed mouse genetics, he was a great friend and colleague to many and an ongoing inspiration to all who knew him.

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