

UNIVERSITY OF WISCONSIN  
Madison, Wisconsin  
Department of Botany

1. Freezing the genetic landscape - the preservation of diversity in cultivated plants as an urgent social responsibility of the plant geneticist and plant taxonomist.

Natural selection, and thus the continuation of evolution, is dependent on the amount of variability present in a population. In cultivated plants, variability allows selection for valuable goals such as disease resistance or high yield and, considering man's absolute dependence on his food plants, needs absolute protection. In a cultigen, variability is usually greatest in its evolutionary "cradle" region, where wild, weedy, and primitive cultivated forms tend to mingle in highly heterozygous and hybridizing populations of truly irreplaceable scientific value. In primitive societies, these nodes of variability persisted unimpaired for millenia, even after a crop became highly evolved elsewhere. Today, "progress"-oriented agriculture and massive technology, often blindly conspiring with greed, hunger, population pressures and ignorance, deliberately replace this low-yielding primitive diversity with high-yielding advanced uniformity. The corn blight of 1970 is but an ill omen of the disasters such uniformity will bring to man in the future.

Taxonomists and geneticists must counteract these ill-advised trends in several ways: first, by doing sound taxonomic-geographic-evolutionary work; second, by explaining the biological-genetic issues to the scientific public; and last, by urging drastically new and ingenious approaches to the preservation of genetic variability, especially in cultivated phylads. The widely supported preservation of genetic diversity in cold-storage gene banks, as in the national seed bank at Ft. Collins, Colorado, has short-term utility for research but is easily susceptible to accidents, such as power failures, and to loss of seed viability. It provides no long-term solution. The only way we can hope to save a crop's dynamic evolutionary potential is to literally protect the diverse "ancestral" genotypes in their cradle region from modern agricultural interference, in effect, by "freezing" the genetic

landscape, even to the extent of subsidizing primitive agricultural systems. In the case of truly wild "ancestral" species we need to preserve them outright and manipulate their habitats, as in a wildlife preserve, in situ.

Only by the deliberate and permanent preservation of selected specific local genetic landscapes, scientifically justified, politically negotiated, and perhaps internationally subsidized, and by the deliberate exclusion of agricultural "improvements" as represented by the "Green Revolution" and modern agricultural technology, is there any hope for long-range success in continuing the evolution of our crops. By placing specific regions "off limits" to agricultural aid, one to several areas for each crop, the slow processes of primitive cultigen evolution would be allowed to continue without marked loss of variability. In the case of potatoes, one could set aside the Lago Titicaca basin as an International Potato Diversity Zone. Here, not only the Indians' potato fields with their 500 odd named cultivars could survive, but also their adjoining weedy and wild potato populations would be protected from well-meaning agricultural experts and their genetically uniform strains. In the case of corn, it is imperative to protect several local regions of high diversity in Mexico, Guatemala, Colombia, Peru and Brazil from genetic "improvement." In addition, the 5 major races of Zea (Euchlaena) mays mexicana sensu lato, the wild grass 'teosinte', are in urgent need of preservation. Even though one or several of these races gave rise to cultivated Zea mays, erroneous taxonomy produced a veritable maize mystique which so confounded evolutionary understanding that these potentially highly valuable taxa, ancestral to corn as they are, were considered nothing but inconsequential weedy hybrids. Sound taxonomic and genetic work enables recognition of a crop's ancestral taxa, and thus compels their preservation. Only by the rigid protection of specific, primitive regional genetic landscapes will man be able to preserve the vast array of potentially valuable genotypes and phenotypes and give crop breeding a solid future. The taxonomist and geneticist here have a crucial and indispensable role.

Hugh H. Iltis