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Molecular Microbiology 2021 "Sixty years of molecular genetics and a new deal for small farmers"

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It was in 1953 that James Watson and Francis Crick along with Maurice Wilkins and Rosalind Franklin announced the Double Helix Structure of the DNA molecule, which is the chemical substance of heredity. This opened up the science of molecular Genetics or what is also referred to as the new genetics. Since then, many Nobel Prizes have gone to scientists, who have been working in the field of molecular genetics as applied to physiology, medicine and health. Recombinant DNA technology has become the most important contribution of modern biotechnology.

Biotechnology extends the frontiers of human capability with reference to the transfer of genes across sexual barriers. The need for novel genetic combinations is growing day by day because agriculture is confronted with new challenges arising from climate change and habitat loss. We will have to produce more and more food, feed, fodder, fibre and medicinal and industrial crops from diminishing per capita land and water availability, and expanding biotic and abiotic stresses. This challenge can be met only by an intelligent integration of the tools of Mendelian and molecular genetics. While the hard core of biotechnology is recombinant DNA technology, tissue culture techniques and marker assisted selection also provide opportunities for achieving many of the desired breeding objectives. Both agriculture and industry need for their progress continuous improvements in technology since technology is the prime mover of change. The growing environmental pollution necessitates more research in the field of bio-remediation.

The Norin dwarfing genes in wheat and the Dee-gee-woo-gen dwarfing gene in rice proved to be transformational genes, since they revolutionized the yield potential of these important staple grains. Biodiversity is the feedstock for the biotechnology industry. Therefore the conservation and sustainable use of biodiversity are essential requirements for breeding new varieties of crops. The loss of every gene and species limits our options for the future. Biotechnologists should play an active role in genetic resources conservation. In the field of agricultural biotechnology, an urgent need is for genetic strains which can help to foster an ever-green revolution leading to improvement in productivity in perpetuity without associated ecological harm. This would call for the mainstreaming of ecological principles in technology development and dissemination. Examples are: Integrated Pest Management (IPM) and Integrated Nutrient Supply (INS). Breeding for high yield has to be associated with the standardization of methods for feeding for high yield.

Due to lack of a regulatory system which inspires public, professional, and political and media confidence, we are not able to derive full benefit from advances in molecular genetics. It is important that we attend to this missing link in the field of biotechnology and get the biosafety regulatory authority established with the approval of Parliament, as recommended by the Basudeb Acharya led Parliamentary Committee on Agriculture. 2013 also marks the transition in the area of providing social protection against hunger from a patronage to a rights' approach. Chhattisgarh has already enacted a Food Security Bill based on a rights approach. Therefore, there is need for harnessing all the tools of modern science for the purpose of helping farmers to feed the country.

The 60th Anniversary of the discovery of the double helix structure of DNA provides an excellent opportunity for assessing the progress made in agricultural, industrial, medical, and environmental biotechnology. Knowledge is a continuum and therefore more speedy progress takes place when traditional wisdom and modern science are integrated in a mutually reinforcing manner. This is the best tribute we can pay to such dedicated and innovative scientists like Watson and Crick who have helped to shape the transformational technology of new genetics