Changes that affect the structure of chromosomes can cause problems with growth, development, and function of the body's systems. These changes can affect many genes along the chromosome and disrupt the proteins made from those genes.

Structural changes can occur during the formation of egg or sperm cells, in early fetal development, or in any cell after birth. Pieces of DNA can be rearranged within one chromosome or transferred between two or more chromosomes. Some changes cause medical problems, while others may have no effect on a person's health.

Chinese scientists have reported editing the genomes of human embryos. The team attempted to modify the gene responsible for β-thalassaemia, a potentially fatal blood disorder, using a gene-editing technique known as CRISPR/Cas9

Some say that gene editing in embryos could have a bright future because it could eradicate devastating genetic diseases before a baby is born. Others say that such work crosses an ethical line: researchers warned that because the genetic changes to embryos, known as germline modification, are heritable, they could have an unpredictable effect on future generations.

http://ghr.nlm.nih.gov/handbook/mutationsanddisorders/structuralchanges

http://www.nature.com/news/chinese-scientists-genetically-modify-human-embryos-1.17378

Insect attack is a serious agricultural problem leading to yield losses and reduced product quality. Insects can cause damage both in the field and during storage in silos. Each year, insects destroy about 25 percent of food crops worldwide.

Bacillus thuringiensis, or Bt, is a bacterium that has attracted much attention for its use in pest control. The soil bacterium produces a protein that is toxic to various herbivorous insects. The protein, known as Bt toxin, is produced in an inactive, crystalline form. When consumed by insects, the protein is converted to its active, toxic form (delta endotoxin), which in turn destroys the gut of the insect. Bt preparations are commonly used in organic agriculture to control insects, as Bt toxin occurs naturally and is completely safe for humans.

Researchers have used genetic engineering to take the bacterial genes needed to produce Bt toxins and introduce them into plants. If plants produce Bt toxin on their own, they can defend themselves against specific types of insects. This means farmers no longer have to use chemical insecticides to control certain insect problems.

http://www.gmo-compass.org/eng/agri_biotechnology/breeding_aims/147.pest_resistant_crops.html

Imagine the perfect dairy cow. For eight years she has gotten pregnant on the first try, given birth easily, and produced gallon upon gallon of the best milk. Even when others in the herd got sick, she stayed healthy. The farmer has depended on this cow and her daughters in lean times to carry the farm through, but now she is at the end of her reproductive life.

Although the farmer may have this cow's daughters to carry on the line, he also has another alternative: copying her. Biological copying is referred to as cloning. By cloning his prize cow, breeding the clones, and keeping their offspring, the farmer can introduce the natural positive characteristics into the herd quickly. It would take several more years to achieve these same improvements by conventional breeding.

Researchers have been cloning livestock since 1996. When it became apparent that cloning could become a commercial venture in 2001, the Food and Drug Administration's Center for Veterinary Medicine asked that food from clones and their offspring be voluntarily kept out of the food chain. FDA then began an intensive evaluation that included examining the safety of food from these animals.

http://www.fda.gov/AnimalVeterinary/SafetyHealth/AnimalCloning/ucm055513.htm

Ever since “Jurassic Park,” the possibility of bringing extinct species back to life has been part of our collective imagination. The film was itself inspired by actual scientific breakthroughs in the early 1990s that allowed scientists to use DNA from museum specimens and fossils to recreate the genome — or genetic blueprint — of dead animals. When the film debuted, the science wasn’t advanced enough to bring back extinct species. But today it might well be, and researchers’ growing efforts to recreate extinct species have been making headlines.

It isn’t possible to bring dinosaurs back to life, scientists say, because their DNA is too degraded after millions of years. But work is now under way to bring back more recently extinct species. This includes research at the University of California-Santa Cruz aimed at restoring passenger pigeons, and Harvard scientists’ attempts to bring back the woolly mammoth.

There are significant practical, ethical, and legal questions yet to be worked out, such as whether de-extincted species would be protected by the Endangered Species Act and whether they could find sufficient habitat in which to thrive. Nevertheless, scientists around the world are moving ahead to try and bring species back.

http://www.pbs.org/newshour/updates/reawakening-extinct-species/