

BOSTON UNIVERSITY PHOTONICS CENTER CHALLENGE INTRODUCTION

Genomics, the study of the complex system of genetic information of an organism, has revolutionized the life sciences. Armed with a detailed understanding of life on the molecular level, scientists have new resources to prevent and fight disease, improve agricultural practices and food safety, and create new life-based technologies for energy and environmental applications.

Every cell needs certain proteins to function properly. Although DNA is the same in every part of an organism, only certain genes are "turned on" in each type of cell. These genes are the ones that give a cell, whether in your heart, your liver, or your little finger, its unique properties. Scientists use the term "gene expression" when they talk about the genes that are actively involved in producing the proteins needed for cell functioning. Many diseases are caused by a change in gene expression that results in not enough or too much of protein being produced in a cell. A tool that allows the rapid investigation of gene expression would be valuable to both researchers and diagnosticians.

One of the most important tools in genomic research is the DNA microarray, sometimes called a "DNA chip." Consisting of tens of thousands of micron-sized DNA "dots" on a glass or film substrate, the microarray allows thousands of gene expression tests to be conducted at the same time.

DNA microarrays are commercially available from a number of biotech companies. But what if you needed to make a specific type of chip, one that is not readily available from a commercial source? Could you make one yourself? Let's visit the Boston University Photonics Center to find out if optics can provide the solution.