

Advanced Instrumentation, Automation, and Informatics for the Human Genome Project, General Biology, and Medicine

Skip Garner¹

A multidisciplinary team of physicists, biologists, computer scientists and engineers has been assembled to explore the fertile area at the boundary of biology and physics. Devices, software, methods and algorithms have been developed and most are commercialized. Basic research and development is done in the Bioscience Division at General Atomics, and the San Diego Genome Center. Prototype devices, software, and methods are the outcome of the basic research which are then transferred to HELIX, a subsidiary of General Atomics for commercialization. Many of the non-biologists in the two units originally worked in the Fusion Division at General Atomics and use the techniques and experience from Fusion research in their work. In particular, biomedical instrumentation based on Fusion diagnostics techniques has been one outcome. This work is funded internally or through NIH grants.

The San Diego Genome Center, a joint collaboration between the Salk Institute for Biological Studies and General Atomics, is charged with mapping and sequencing chromosome 11 (to start). This large genome center

will develop and then deploy for routine use automation systems to speed the gene mapping and sequencing process.

The Biosciences Division is conducting research in a number of areas, the Human Genome Project, bioremediation, cholera vaccine development, advanced protein folding diagnostics, yeast genetics and repair, methods development and theoretical modeling of biological processes. We expect to soon transfer several new automation systems and related software to HELIX to mass produce and market. These include integrated sequencing and mapping robotics workstations, a Cystic Fibrosis screening diagnostic, a protein folding diagnostic and a local parallel computer system for DNA and protein analysis.

Products currently on the market by HELIX include: miniaturized capillary cells for spectrophotometers and fluorometers, microprocessor controllers for thermal cycling machines, DNA sequence reading software, dot blot reading software, an advanced miniature fluorometer, assorted robotics tools, a high well density plastic plate for robotic manipulation of biological samples, and an integrated high-throughout DNA extraction and purification system called Prepper, PhD.

¹ San Diego Genome Center; General Atomics, P. O. Box 85608, San Diego, California 92186.