# New Developments in High Performance Magnetic Separation Technology for Laboratory and Industrial Applications

**David Humphries, Martin Pollard**

D.O.E. Joint Genome Institute, Lawrence Berkeley National Laboratory

***Abstract***

**New high performance Hybrid magnetic separation technology has been developed at the D.O.E. Joint Genome Institute and Lawrence Berkeley National Laboratory* for general laboratory and high throughput automated applications. This technology has broad applicability for molecular separation in the areas of genomic automation, high throughput screening and proteomics among others. Its applicability ranges from large and small scale microtiter plate processes and flow separation processes to single molecule DNA manipulation. It is currently an enabling purification technology for very high throughput production sequencing at the D.O.E. Joint Genome Institute. This technology incorporates hybrid magnetic structures that combine linear permanent magnet material and ferromagnetic material to produce significantly higher fields and gradients than those of currently available commercial devices. The higher maximum fields and strong gradients of the hybrid structures result in greater holding forces on magnetized targets that are being processed as well as faster extraction. Current development versions of these magnet plates have exhibited fields in excess of 1 tesla and gradients exceeding 1000.0 tesla/meter. Hybrid magnet plates for 384-well micro-plates are currently in production use at the JGI. More recently, Hybrid magnet plates have been developed for both shallow and deep well micro plates with 96-wells. In addition, early prototyping has demonstrated clear applicability to 1536 well plates and higher density applications. This technology is currently being made available to industry through the Tech Transfer Department at Lawrence Berkeley National Laboratory. This research was funded by the Biological and Environmental Research Program and the US Department of Energy's Office of Science.**

*This work was performed under the auspices of the US Department of Energy's Office of Science, Biological and Environmental Research Program and the by the University of California, Lawrence Livermore National Laboratory under Contract No. W-7405-Eng-48, Lawrence Berkeley National Laboratory under contract No. DE-AC03-76SF00098 and Los Alamos National Laboratory under contract No. W-7405-ENG-36.