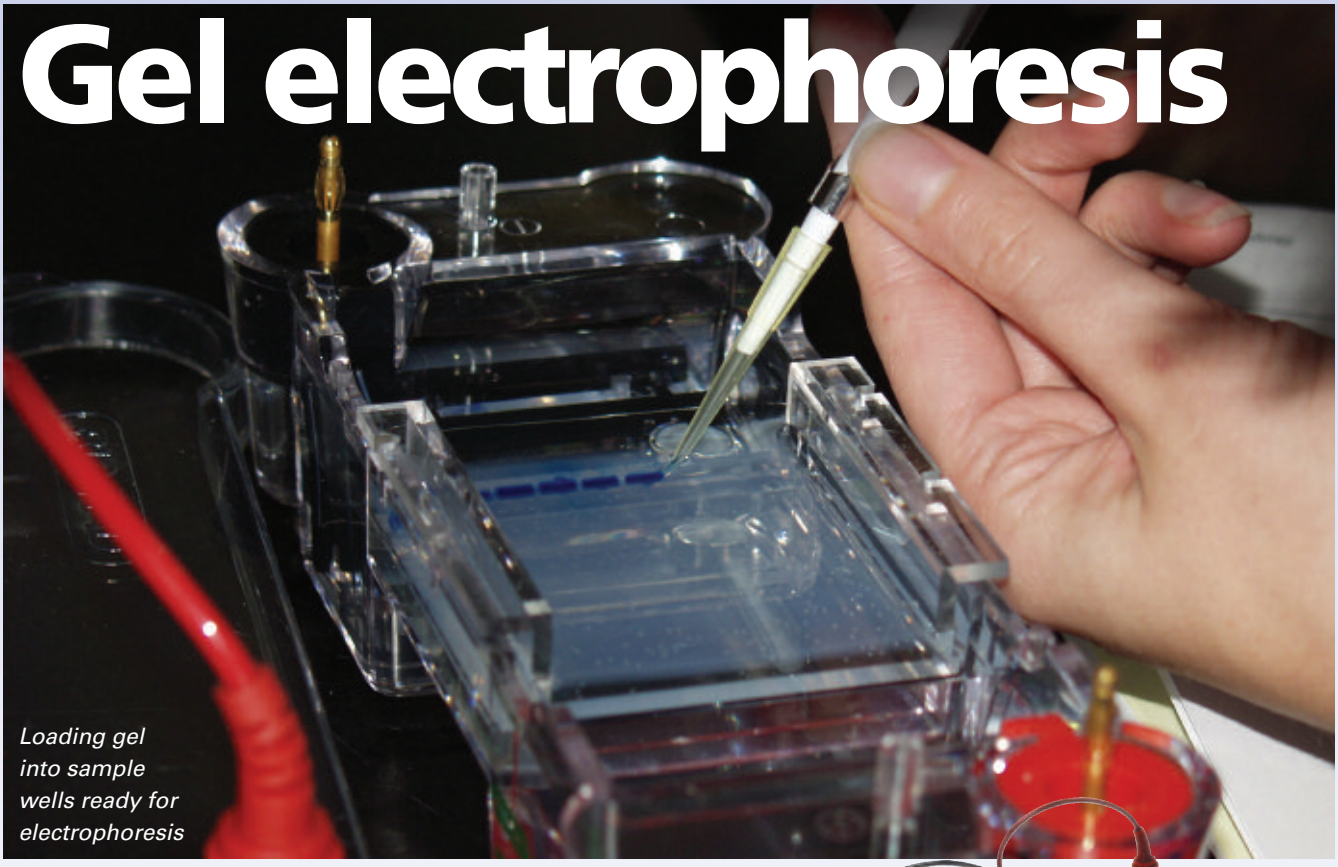
Gel electrophoresis



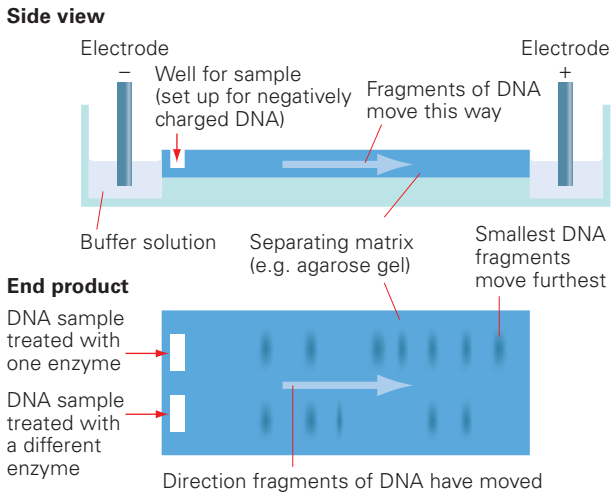
Loading gel into sample wells ready for electrophoresis

BBSRC/University of Edinburgh

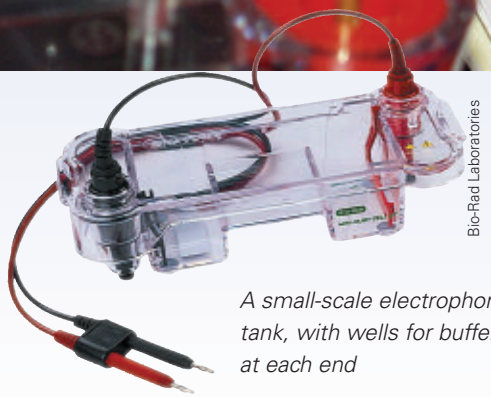
Gel electrophoresis is used to separate big molecules, in particular nucleic acids and proteins. To learn more about the structure and function of large molecules such as DNA and proteins, they can be broken up into smaller fragments, using enzymes.The molecules are separated on the basis of size and on the electrical charge they carry, as well as other properties.

Look at the diagram. The electrical current from one electrode repels the molecules while the other electrode attracts them, depending upon the electrical charge they carry. DNA fragments usually carry a negative charge and so move towards the positive electrode. The gel material acts as a 'molecular sieve', separating the molecules or fragments of molecules by size.

The process of electrophoresis



The end product: agarose gel sheet with bands from treating DNA with different restriction enzymes. Bands are revealed by staining or using UV light



Bio-Rad Laboratories

A small-scale electrophoresis tank, with wells for buffer solution at each end

The final positions of the separated molecules, relative to one another in the gel sheet, can be shown up by staining.

Gel electrophoresis is an important tool in molecular biology and is of great value in many aspects of genetic manipulation and study. These include DNA fingerprinting, the Human Genome Project and genetic engineering. The process is so sensitive that it is possible to separate and identify protein molecules that differ by as little as a single amino acid.

Front cover *The background of the front cover photo shows the results of separating fragments of DNA by electrophoresis. In this case there were a great many wells, filled at the start with fragments of DNA that had been tagged with a radioactive marker. Following electrophoresis each spot on the gel was picked out by laying photographic film over the gel and developing it. The radioactive fragments of DNA fogged the film above the spots where they occurred.*