East Carolina University *Office of Technology Transfer*

ECU SEEKS PARTNER TO LICENSE

Novel Method for Separation of Large Molecules

East Carolina University is actively seeking licensing partners to develop and commercialize applications of an exciting new method of separating proteins, DNA strands, and other large molecules that are solvable in water. Current capillary electrophoresis devices are capable of separating molecules based on the magnitude of their charge and their diffusion coefficients. However, a researcher at East Carolina has discovered a new method for separating molecules based only on their diffusivity. This microcapillary technology goes beyond traditional separation methods by providing the ability to more rapidly separate molecules with higher resolution.

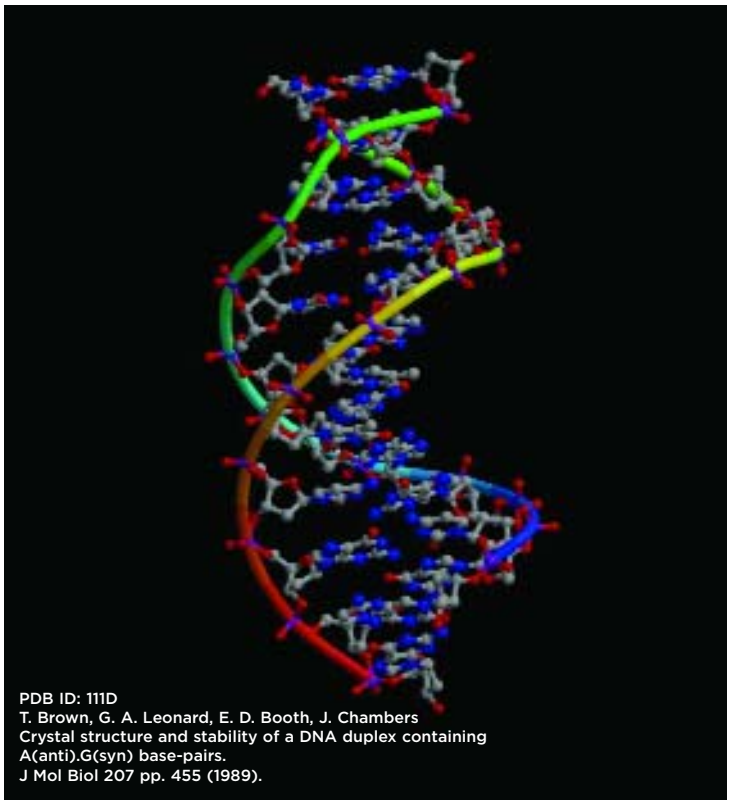
APPLICATIONS

This novel microcapillary separation method could find wide application in pharmaceutical, forensic, chemical, academic, food, and biotechnical industries—such as genomics and proteomics—as it is capable of separating the following molecules for analytical purposes:

- DNA strands
- Proteins
- Other large molecules

ADVANTAGES

- The new method greatly decreases the time required to complete separations, allowing for higher overall throughput.
- The method is capable of separating molecules with ultra-high resolution, far exceeding the capabilities of the methods currently used.
- The method allows the separation of molecules that differ in length even by only a few units, enabling the separation of similar molecules.
- The method is the only one that separates DNA molecules based solely on their diffusivity and is a superior replacement for traditional DNA fingerprinting techniques, which separate molecules based on electric charge and diffusivity.



PDB ID: 111D
T. Brown, G. A. Leonard, E. D. Booth, J. Chambers
Crystal structure and stability of a DNA duplex containing A(anti).G(syn) base-pairs.
J Mol Biol 207 pp. 455 (1989).

TECHNOLOGY

This method involves an electroosmotic Brownian Ratchet in a microcapillary in which interspaced rings are placed around the microcapillary to locally absorb the electric field that drives the electroosmotic flow. Switching the electric field on and off ratchets the diffusion of large molecules dissolved in water. The ultimate net speed of these molecules is dependent only on their diffusion coefficient, and the exact value of their charge is of no consequence. The energy input from the electric oscillation and the differences in the bidirectional setup combine to effectively ratchet the diffusion of the molecules as diffusion is allowed and amplified in one direction while inhibited in the opposite direction.

ABOUT THE INVENTOR

Dr. Martin Bier is an assistant professor of physics at East Carolina University. His research interests involve biological processes at the molecular level. Dr. Bier is a successful inventor, already with a commercialized patent in his name. Dr. Bier earned his doctorate in mathematics at Clarkson University in 1990.

Faculty web page:
http://www.ecu.edu/physics/bier.html.

SELECTED PUBLICATIONS AND PATENT

- M. Bier, M. Kostur, I. Derenyi, and R. D. Astumian, "Nonlinearly coupled flows." *Physical Review*. E 61 (6), 7184–7187. 2000. (M. Bier, "Motor Proteins.")
- M. Bier, T. R. Gowrishankar, W. Chen, R. D. Astumian, and R. C. Lee, "Resealing dynamics of a cell membrane after electroporation." *Physical Review*. E 66, 062905–062908. 2002.
- M. Bier, "Processive motor protein as an overdamped Brownian stepper." *Physical Review Letters.* 91 (14), 148104_1–148104_4. 2003.
- H. van Mil, J. Siegenbeek van Heukelom, and M. Bier, "A bistable membrane potential at low extracellular potassium concentration." *Biophysical Chemistry*. 106, 15–21. 2003.
- M. Bier, "Modeling processive motor proteins—Moving on two legs in the microscopic realm." Accepted for publication in *Contemporary Physics*.
- M. Bier, "Separation of Small Particles." US6001266.

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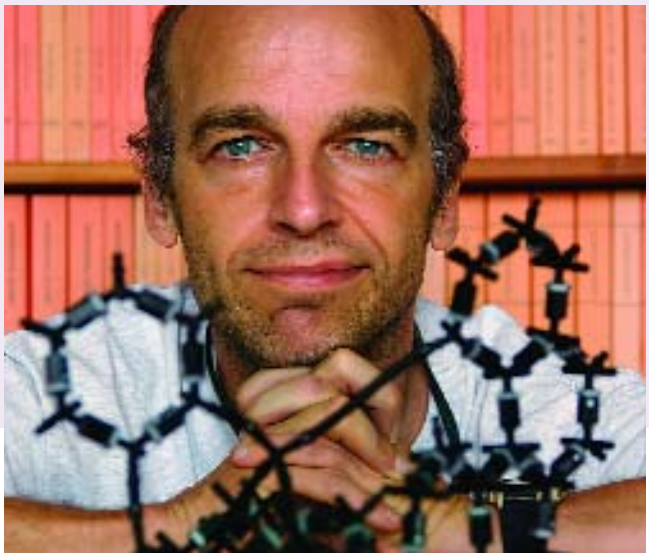

Dr. Martin Bier

Breakthrough Research at East Carolina

For nearly a century, East Carolina University has served the people of North Carolina and the nation. From modest beginnings as a teacher training school, East Carolina has grown to become an emerging, national research university with an enrollment of nearly 22,000. East Carolina is focused on using new technology to improve the quality of life for the public. East Carolina received three top-ten rankings in a study conducted by the *Chronicle of Higher Education* measuring the practical application of research for the university's success and efficiency in filing patents, licensing inventions, and creating spin-off companies. ECU was the only North Carolina university to receive a top-ten ranking in the study. ECU's research has led to the formation of several spin-off biotechnology companies in eastern North Carolina. In addition, ECU has entered into a partnership with Pitt Community College to assist in developing a biotechnology labor pool for the region. Researchers at East Carolina are making discoveries daily that keep in line with the university's mission to serve the public with its tools for innovation.

Tomorrow starts here.

EAST CAROLINA UNIVERSITY

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