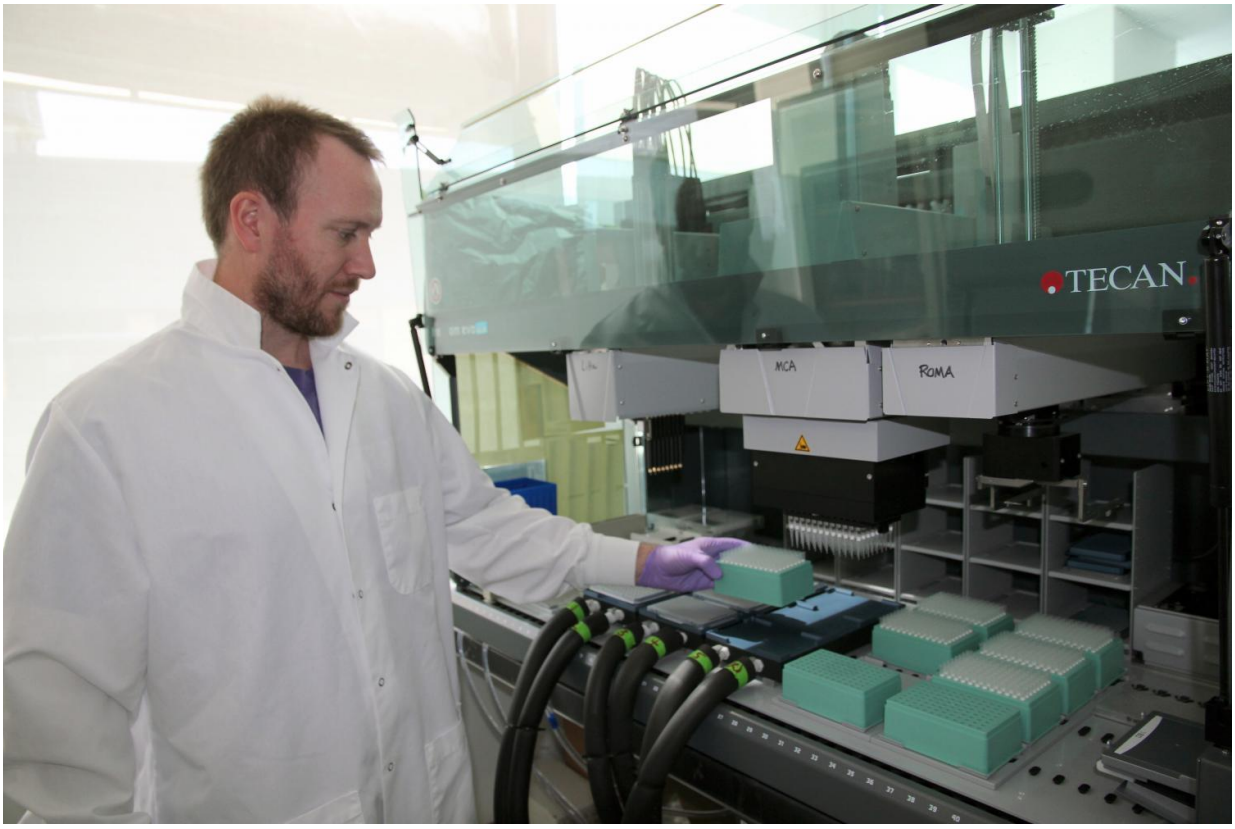
Innovations enhance genetic analysis of individual cells

August 10 2017



Brian Thompson, a research associate in the Single Cell Genomics Center at Bigelow Laboratory for Ocean Sciences, loads samples into a liquid handling robot. The Laboratory recently published the details of significant advances in single cell genomics technology, which allows scientists to study the genes of individual cells. Credit: Bigelow Laboratory

Single cell genomics technology has given scientists the ability to individually read the genetic blueprints of cells, the most fundamental units of life. Now, the center that pioneered the technology, Bigelow Laboratory's Single Cell Genomics Center, has developed several key enhancements to the technology and published them in *Nature Communications*.

"During the past decade, single cell genomics has evolved from science fiction to a trusted tool for biological research into subjects as diverse as the ecology of the ocean, the evolution of life, and the health of humans," said Ramunas Stepanauskas, director of the center and a senior research scientist at Bigelow Laboratory.

The enhanced techniques have already benefitted numerous studies conducted with Bigelow Laboratory's assistance, ranging from the Gulf of Maine to the human body to world's deepest mines and the NASA spacecraft destined for Mars in 2020. They have also led to the development of several more advanced and cost-effective services that the center announced this month, making the technology widely accessible to research and industrial communities.

Traditional genetic analysis requires scientists to keep microorganisms alive in the laboratory, so that they can be grown to a large enough quantity - billions of cells - for DNA studies. As most microscopic organisms require conditions that are difficult to replicate in a lab, traditional methods are of limited use for examining most of life and genetic diversity on Earth.

"Single cell genomics has shown us that the microscopic world is larger and more complex than most ever believed possible," Stepanauskas said. "As this technology has been revolutionizing scientific studies, we have also been rapidly evolving our approaches to enhance their effectiveness and affordability."

The recent publication details several enhancements that Bigelow Laboratory's team has made to the technology and their impact on the study of microbes found in the environment. The enhancements include increasing the fraction of a genome that is recovered, coupling a cell's genome with valuable information about its size and other physical properties, as well as a major improvement in the technology's scalability.

"These developments and the new services they enable continue to grow the power and utility of this technology to aid researchers in their quest to understand the microbes that drive the planet and its health," Stepanauskas said. "We are also increasingly seeing biomedical researchers utilizing our technology, opening a new door to possible improvements in human health."

More information: Ramunas Stepanauskas et al, Improved genome recovery and integrated cell-size analyses of individual uncultured microbial cells and viral particles, *Nature Communications* (2017). DOI: 10.1038/s41467-017-00128-z

Provided by Bigelow Laboratory for Ocean Sciences