



The Seine by the Grand Jatte, by Georges Seurat, 1888. Multiomics can be compared to pointillist paintings, in which thousands of tiny dots, when combined, bring a clearer image into focus. Public domain photo by The Yorck Project

Unlocking a world of complete biological understanding

Here's why Illumina is uniquely positioned to bring multiomics to scale
From Steve Barnard, PhD, chief technology officer

AS A 27-YEAR-VETERAN of Illumina, I've watched the life sciences industry fundamentally evolve thanks to advances in genomics and precision health. Illumina was the original catalyst and continues to be the driving force to bring genomic breakthroughs to a scale that had never been imagined. Now we are doing the same in the next frontier: multiomics. We believe this work will once again redefine how we think about biology and medicine.

Ever since I joined Illumina in 1998, I've had the honor of contributing to scientific advancements in genomics that have enhanced our understanding of human health. Together with my colleagues past and present, we took a nascent area of scientific understanding and unlocked its potential on a global scale. We were not the first to sequence the human genome. But we made genomic sequencing accessible at scale. We introduced the quality and reliability needed to enable consistent and rapid discoveries, and clinical applications.

Today, Illumina customers generate the equivalent of eight human genomes of data per minute—that's 27 billion base pairs—every minute of every day. The discoveries they've made have accelerated profound

breakthroughs in precision medicine, helped put an end to many diagnostic odysseys in rare disease, and opened the door to molecular testing and targeted therapies for cancer patients.

But, with every answer to every question, we see even more questions. We see more opportunities to drive a deeper understanding of biology. How do proteins impact our biology? How do different types of cells interact? What do changes in an individual cell mean for other tissues nearby? Building on our history of leadership in genomics, today we recognize that we've merely scratched the surface.

Genomics helps us map our DNA makeup. Now we see an incredible future when the same advances in next-generation sequencing unlock the same scale, quality, and reproducibility across all of the omes—genomics, transcriptomics, metabolomics, epigenetics, proteomics, and more. This will create an even stronger foundation of molecular insights—one that combines data from many different biological sources to unlock the complete picture of human health.

Multiomics takes genomics to the next level.

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Multiomics is the next key to understanding our biology. It will unlock the places where discovery has been elusive and will transform barriers into breakthroughs. To put it simply, multiomics is the use of multiple omics to study complex biology and uncover associations and processes that no single approach would reveal. In this way, multiomics is like a postimpressionist pointillist painting, where thousands of dots come together to create a complete image. Each tiny dot—each individual omic data point—contributes to the comprehensive understanding that is taking shape today and elucidates the beautiful world of biology.

Multiomics allows us to build a world of complete understanding—a world where you could know whether you had cancer before you had any symptoms; where you could be treated with therapies specific to your genetic mutations; and where Alzheimer disease could be treated at an early stage. Unleashing the full potential of multiomics will transform everything, from the pace of scientific discovery and how quickly new drugs come to market to how we diagnose, detect, and treat life-threatening disease.

Illumina leads the way in accelerating discoveries that make the complex parts of biology simple by translating data into insights with unprecedented speed. Our portfolio of multiomic solutions and sequencing applications are enabled on our trusted platforms and are complete with analysis capabilities that deliver the highest value for customers at the lowest end-to-end cost.

In our journey to unleash the power of multiomics, we're reimagining what's possible with spatial and single-cell sequencing technology. These innovations unlock applications and experiments that were previously out of reach.

- For instance, we are collaborating with the Broad Institute to set a new standard for single-cell research and accelerate the development of a 5 billion cell atlas within the next three years.¹ This is possible because

of the scale and consistency we've developed in our new single-cell CRISPR technologies.

- We also unveiled a new spatial technology that will empower researchers to map complex tissues and understand cellular behavior at an unprecedented scale.²

These advances wouldn't be possible without our partners and customers who are at the forefront of this transformative work. At the 2025 Advances in Genome Biology and Technology General Meeting, we heard from researchers at the Broad Institute, St. Jude Children's Research Hospital, and TGen about the ways they are using Illumina's spatial technology to drive real-world breakthroughs.³ Their biological findings include a theory for pulmonary fibrosis pathway activation and tissue modeling, insights into the progression of prostate cancer, and the discovery of new genes related to brain development.

The journey from sequencing the first human genome in 2003 to today's multiomics landscape has been nothing short of remarkable. In the past two decades, countless research advances, medical breakthroughs, targeted therapies, and preventive strategies have been built on Illumina's leadership in genomics. Today, Illumina stands alone in using AI-powered, complete, and integrated workflow solutions to deliver insights across the various omes. These solutions represent a leap forward in discovery.

The next era of biological discovery—and countless lives—depend on bringing omics to scale. We will continue to work tirelessly with customers, partners, and those across the health care value chain to make this future a reality and push the boundaries of what's possible to create a healthier future for all of us. ►

Learn more about Illumina's innovation roadmap here: illumina.com/science/genomics-research/innovation-roadmap.html

1. illumina.com/company/news-center/press-releases/press-release-details.html?newsid=383b9322-6cef-4fdd-8099-05a6f6904872

2. illumina.com/company/news-center/press-releases/press-release-details.html?newsid=10a7ec49-da37-40d8-8aff-0e8e149b9534

3. illumina.com/company/news-center/press-releases/press-release-details.html?newsid=15da9928-16c1-453a-b908-a4469a1fc91c

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