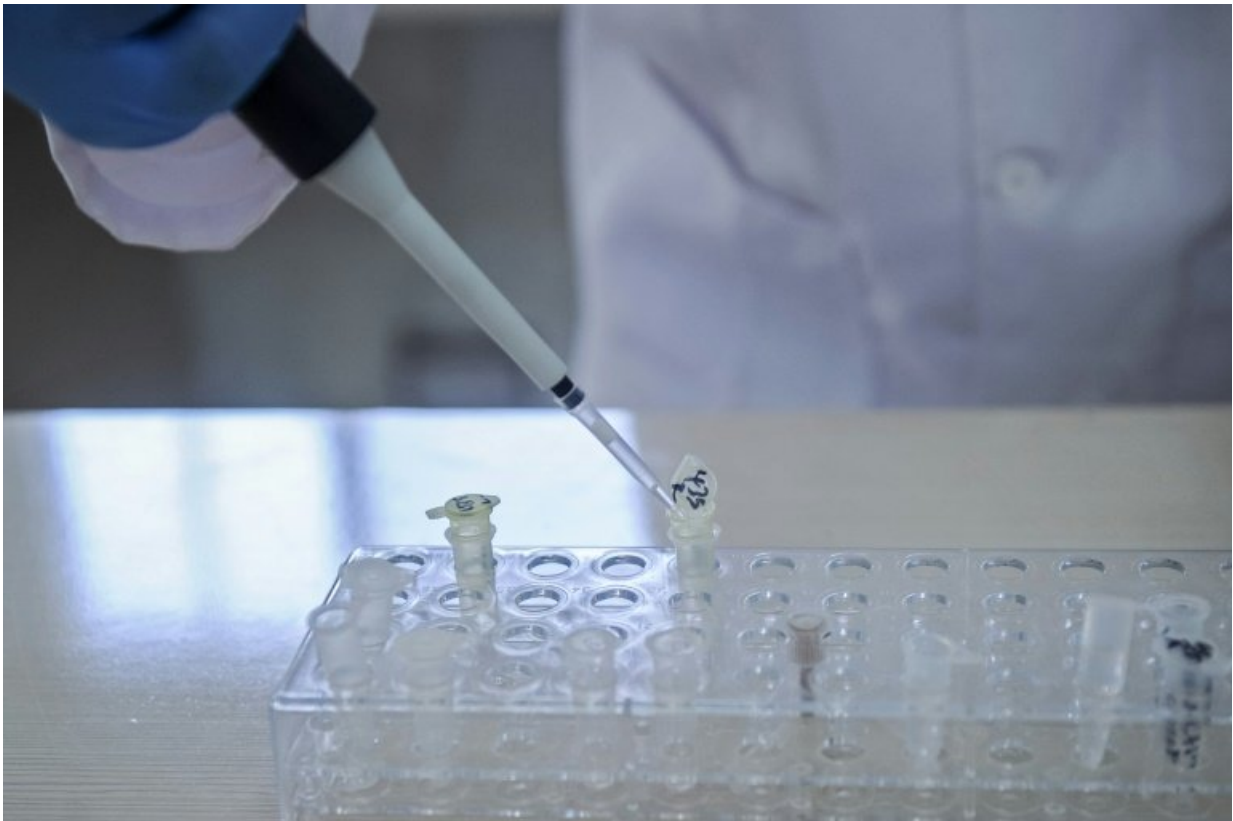


Cell-by-cell DNA science is 'Breakthrough of 2018'

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Experts say new DNA research will transform science over the coming decades, allowing an ever-clearer picture of the process behind aging, healing and disease

The US journal *Science* on Thursday coined as "Breakthrough of the Year" for 2018 new technologies that reveal how DNA cues individual

cells to grow through time.

Experts say these methods will transform science over the coming decades, allowing an ever-clearer picture of the processes behind aging, healing and disease.

"Just as a music score indicates when strings, brass, percussion, and woodwinds chime in to create a symphony, a combination of technologies is revealing when genes in [individual cells](#) switch on, cueing the [cells](#) to play their specialized parts," said the report.

"The result is the ability to track development of organisms and organs in stunning detail, cell by cell and through time."

Modern methods build on the 2002 Nobel Prize–winning work of John Sulston and colleagues, "who mapped the development of the roundworm *Caenorhabditis elegans* by painstakingly watching larvae mature cell by cell through microscopes," said Jeremy Berg, editor-in-chief of the Science family of journals.

"With today's technologies, especially massively parallel DNA sequencing and advanced fluorescence microscopy, the cells that comprise *C. elegans* have been mapped again using tag-analyze-assemble methods based on gene expression patterns within each cell."

'Revolution is just starting'

Scientific papers have been published this year on how a flatworm, a fish, a frog, and other organisms begin to make organs and appendages.

International researchers are hard at work, looking for ways to apply these techniques to [human cells](#)—how they mature, regenerate, and what goes wrong when cancer, diabetes or even physical malformations occur.

Among the projects underway is an international consortium called the Human Cell Atlas, which is identifying "every human cell type, where each type is located in the body, and how the cells work together to form tissues and organs," said the report.

Other scientists are studying kidney cell types, including ones that become cancerous, as well as the interplay between maternal and fetal cells in pregnancy.

A group of 53 institutions and 60 companies across Europe, called the LifeTime consortium, is studying cell by cell how tissues develop cancer, diabetes, and other diseases.

"The single-cell revolution is just starting," said the report in *Science*, which is published by the American Association for the Advancement of Science.

The winner was picked after online readers were invited to vote on a dozen pre-picked breakthroughs for the year.

Of some 12,000 votes cast, the "clear winner" was techniques that enable scientists to track development at the cellular level, it said.

"These technologies create some of the most extraordinary movies ever made, showing how a single cell grows into the intricate tissues and organs of a mature animal," said Tim Appenzeller, *Science's* news editor.

More information: Exploring organisms cell by cell, *Science* 21 Dec 2018: Vol. 362, Issue 6421, pp. 1333, [DOI: 10.1126/science.aaw3633](https://doi.org/10.1126/science.aaw3633) , [science.sciencemag.org/content ... 62/6421/1333.summary](https://science.sciencemag.org/content/362/6421/1333.summary)

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