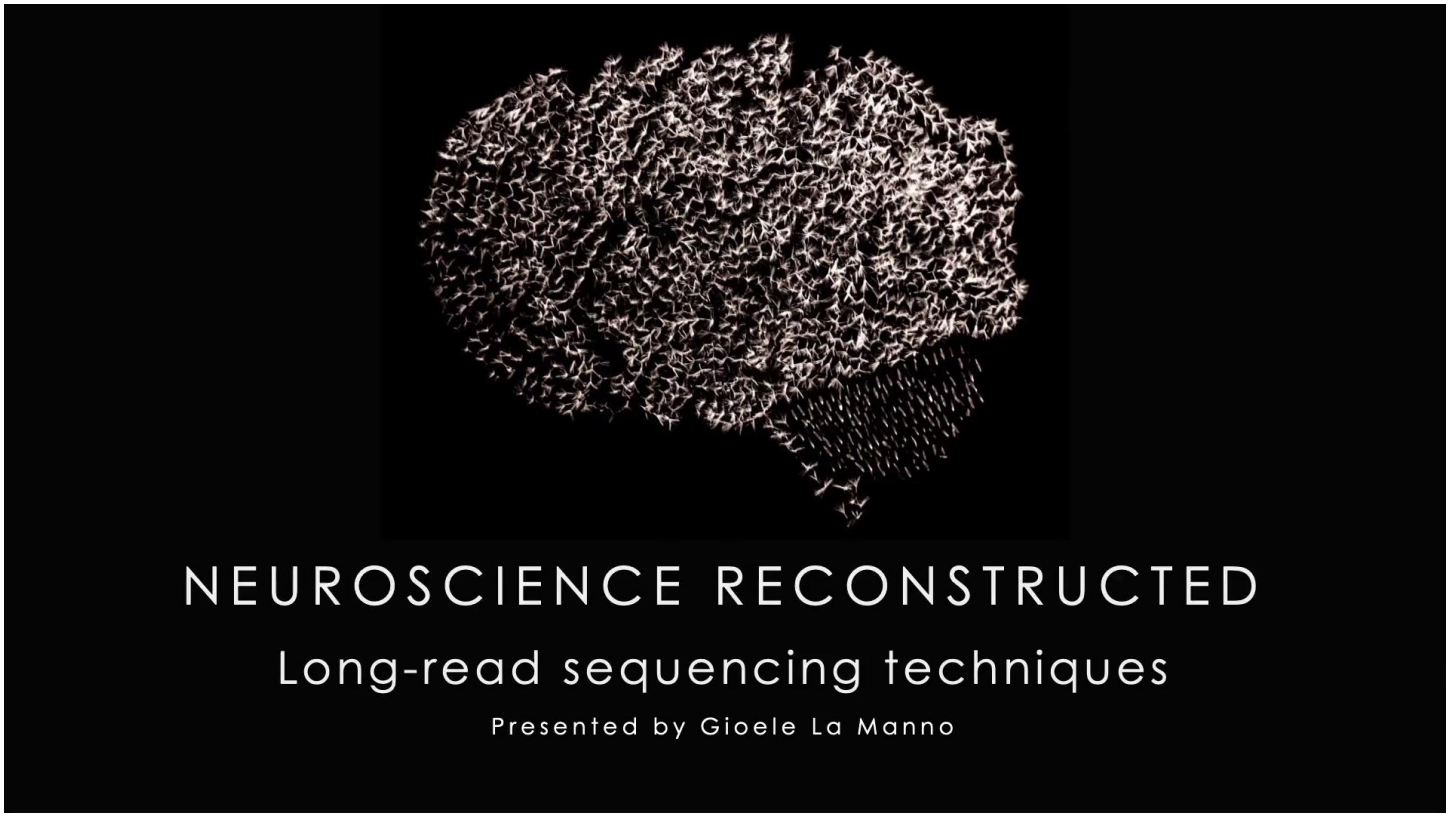

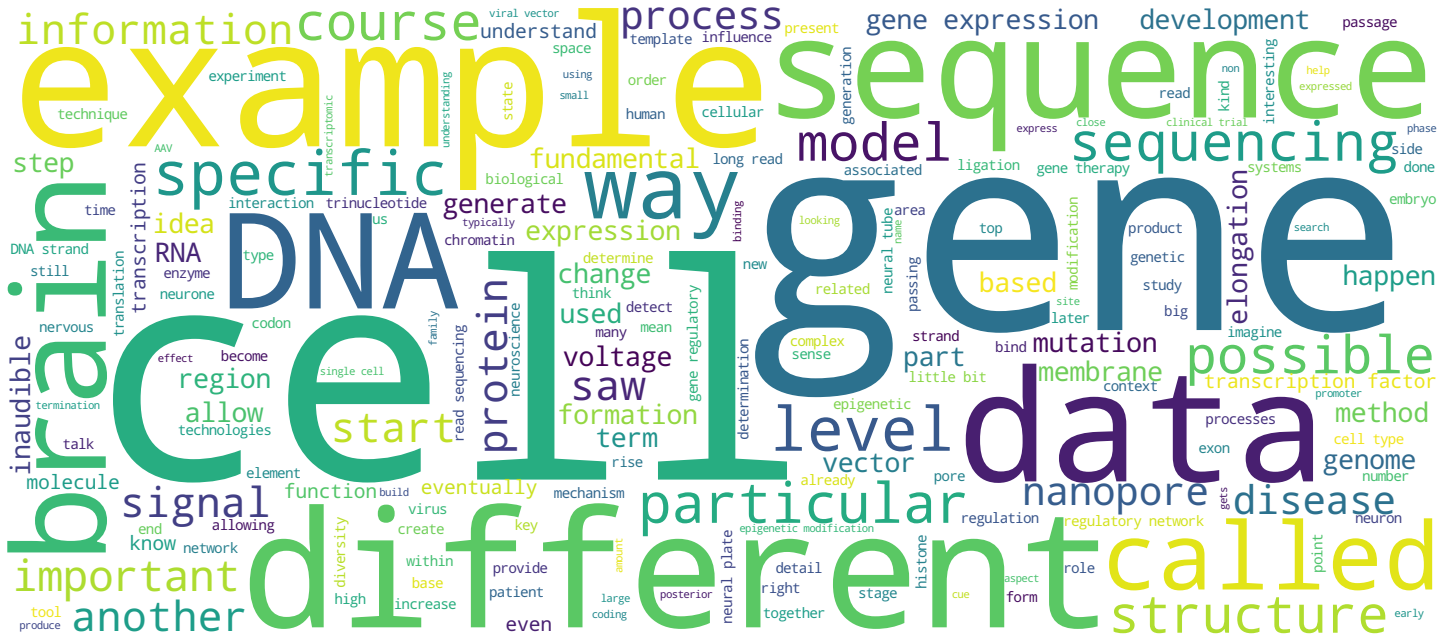

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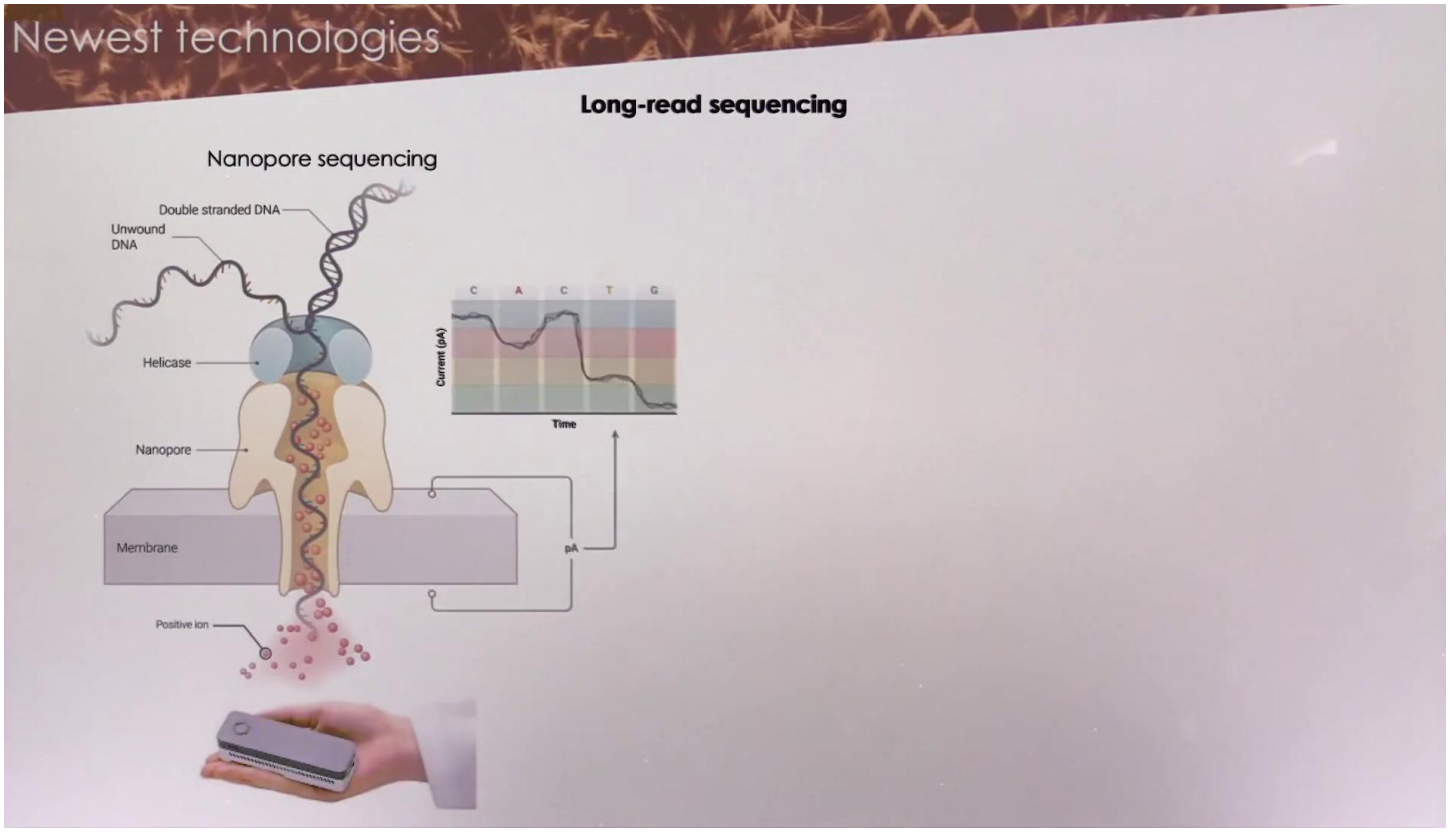
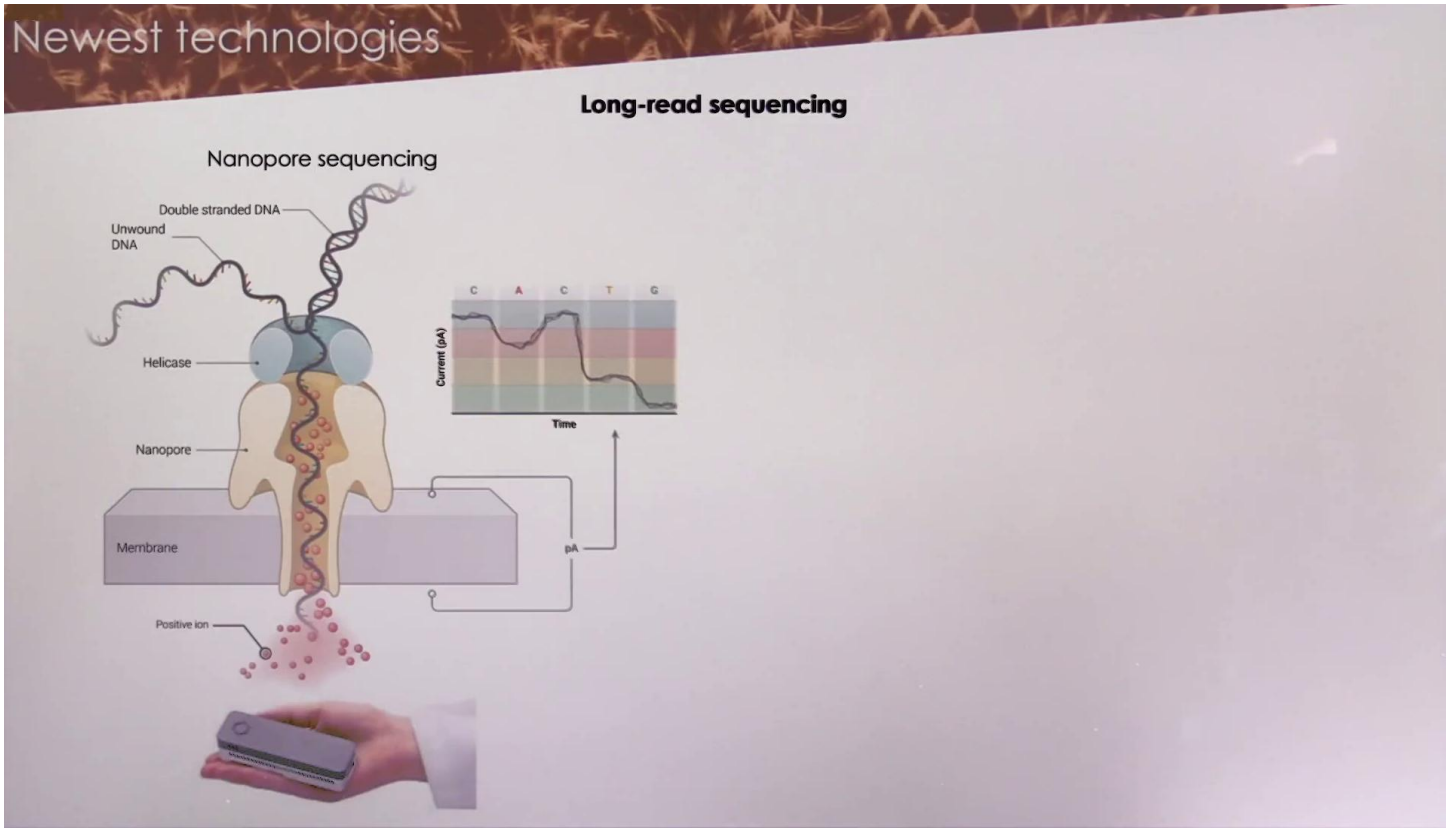


Another very exciting technology that's a bit [inaudible 00:00:08] to all what we saw, most of what we saw was based on enzyme that was either ligating or adding, synthesising DNA strands by elongation. These are the set of methods that's actually based on what is called nanopore based sequencing that are based on more physical principle, the passages, the physical passage of a DNA strand through a nanopore. This nanopore can be in principle, anything in practice. One of the most successful implementation basically using proteins, using membrane proteins that are naturally found, and then eventually in silico and in vitro evolved to do this job efficiently. These nanopores are placed into membranes in such a way that a membrane is associated with one and only one nanopore, and then the voltage between the two sides of the membrane is monitored. The idea is that while the DNA thread is passing, because of the sequence, specifically the different static and electrostatic [inaudible 00:01:31], the different bases go and create into the space through the pore, the flow of ions, and therefore the voltage around the membrane, is going to be influenced by the passage of the DNA.

Notes

Summary

0m 05s

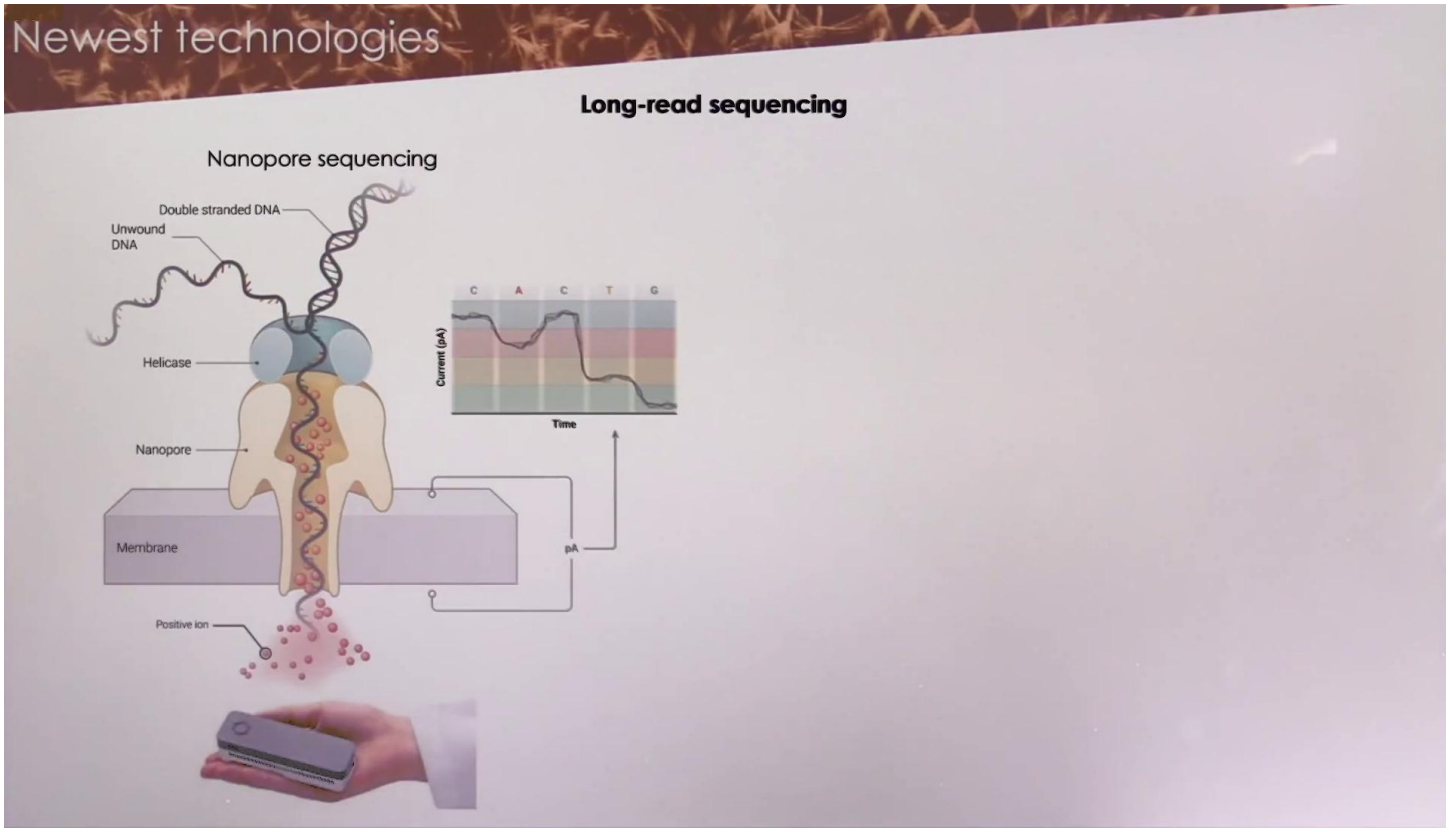


Then the idea that is possible to correlate the passage of particular dinucleotide or trinucleotide through the nanopore with a particular sequence, and then eventually read out and then interpret the voltage, and basically transform it as a sequence, knowing basically the correspondence between the voltage and the dinucleotide or trinucleotide that is passing through the nanopore at that moment. Of course, to make it possible actually, not only the [inaudible 00:02:35] that allows basically unwinding of double-stranded of the DNA, but also of specific modifications to the technique to allow for very slow translocation of the DNA through the pore. Otherwise, naturally the DNA will go very fast through the pore. Basically, engineering in these systems have been focused on trying to make the DNA pass at the right pace for us to be able to detect the change in voltage in the right time frame where the measurement can be accurate. Developing this kind of technology, for example, by Oxford Nanopore, has taken several years, over a decade, and right now, those are actually technologies that anybody can use. Very small devices, really portable that can do this very interesting long-read sequencing.

Notes

Summary

1m 51s

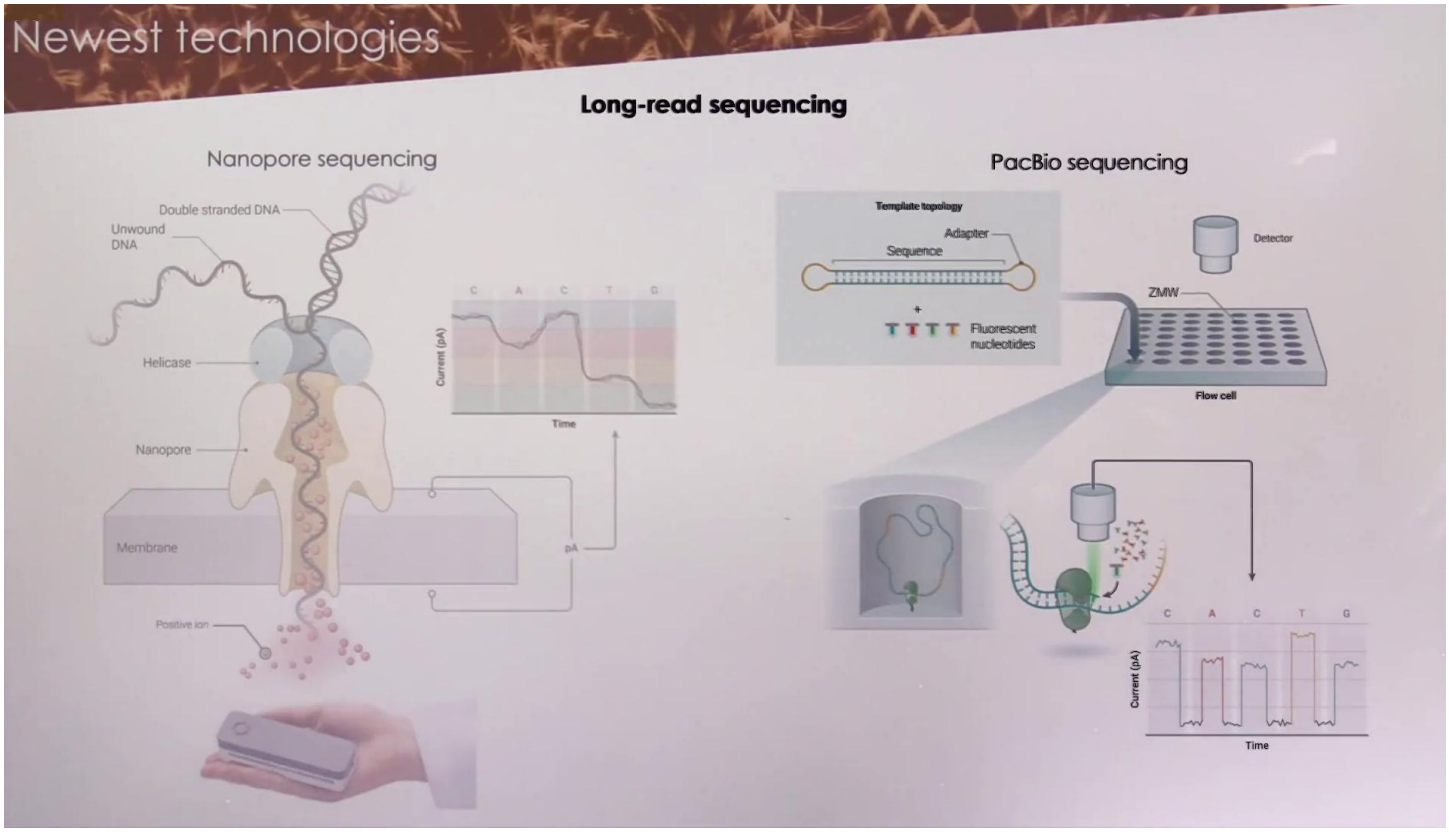


Because indeed now, because there is no ligation, there is no elongation, there is no necessary constraint on the length of the sequence that you can sequence. With this sequence, it's possible to get up to kilobases-length single reads. It's quite something completely impossible with the technologies we saw before.

Notes

Summary

3m 32s



Other methods that allow to achieve long-read sequencing that are somewhat similar to what we saw before in terms of sequencing by synthesis rather than by nanopore are, for example, technology such as PacBio sequencing that exploits the formation of a ring through the ligation of adaptors that have this high pin at the end, allows the formation of basically a topologically-constrained circle of DNA through which a very fast elongation can happen cyclically over and over and over progressively, therefore allowing the increase in terms of accuracy in the determination of the bases, but also allowing the read of much longer stretches of DNA that is possible with the techniques that we described previously. Generally I have to put the nanopore sequencing, so it is a little bit in between what we saw with illumina sequencing and for nanopore technologies here.

Notes

Summary

3m 59s