Next Generation Sequencing – The Role of New Sequence Technologies in Shaping the Future of Veterinary Science

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The Future of sequencing

Neil Hall

Sequencing….the new dot-com?

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29 March 2012 Last updated at 08:22

Share

Roche raises offer for Illumina to over $6bn

Roche has raised its offer for the gene sequencing firm Illumina.

The Swiss firm has raised its offer from $44.50 per share to $51, valuing the deal at more than $6bn (£3.8bn).

Roche hopes the new bid will win over Illumina shareholders who gather for the annual general meeting next month.

Roche is the world's biggest maker of cancer drugs

The purchase of Illumina would help Roche build its personalised healthcare business, as Illumina's gene sequencing technology can identify which treatments suit different patients.

Illumina's management rejected Roche's initial offer made in January, so the Swiss pharmaceuticals giant has now taken its offer directly to shareholders.

"Based on our discussions with Illumina shareholders we have seen interest to accelerate the takeover process," said Roche chief executive Severin Schwan.

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- Sequencing is attracting a lot of investment even in an economic slump
- Driven by human medicine
  - Cancer diagnostics
  - Genetic screens
  - Personalised medicine

Esquire

January 4, 2012

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The Best of 2011

Even amid the chaos and uncertainty of the year, there were some bright and heroic moments. Here, we present seventy-seven things to celebrate.

By Andrew Chaikivsky

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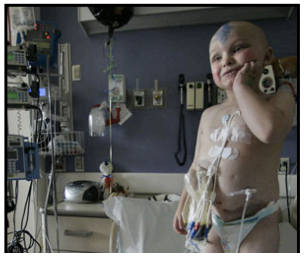

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Baffled by six-year-old Nicholas Volker's deadly intestinal disease, which forced him to eat through a feeding tube, doctors at Children's Hospital of Wisconsin in Milwaukee sequence the boy's genome in an effort to diagnose and cure him ÃƒÂ‚Ã‚Â— **a medical first.** Identifying a never-before-seen mutation in his DNA, they surgically rebuild his immune system through a cord-blood transplant. After a 121-day hospital stay, Nicholas Volker returns home to enjoy his

With Death, Christopher Hitchens And Steve Jobs Showed Us The Limits Of DNA Sequencing

1 comments, 1 called-out + Comment now

Christopher Hitchens, quite famously, did not believe in miracles. His death is a reminder that we shouldn't, either – even when they're the scientific kind.

Hitchens, like Steve Jobs, was among the first patients to benefit from a very new technology: the use of DNA sequencing to pick cancer drugs that might have a better chance of slowing a tumor's growth.

Cells become cancerous because of mutations in their DNA that make them stop behaving as discrete parts of the body and instead cause them to multiply like crazy and run amok. Once a cell is cancer, its genes get twisted and re-arranged even more. The idea is that by

Image by Getty Images Europe via @daylife

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The cancer revolution

When Sarah Allen, a mother of four, discovered she had a virulent form of breast cancer, she feared for her future. Two years on, she is the symbol of a biotechnological success that promises to change for ever our treatment of disease

Jo Revill
The Observer, Sunday 9 March 2003
Article history

Sarah Allen doesn't realise it yet, but she is at the forefront of a cancer revolution. The experience of this Midlands housewife gives us a glimpse into the future of medicine

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Cancer News

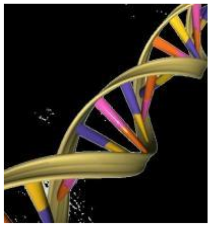
DNA sequencing matches cancer patients to clinical trials

30 November 2011

A scanning machines could help identify cancer idual genetic make-up to match them to appropriate according to scientists in the US.

University of Michigan Comprehensive Cancer ichigan Centre for Translational Pathology (MCTP) ran xploring how to quickly and systematically sequence ial from patients with advanced or treatment-resistant

g DNA to spot which genes are faulty in a patient's tists can identify current clinical trials that include treatments targeted to these



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"We need more intelligent ways to match patients to clinical trials that are likely to be suitable for their particular cancer"

- Kate Law, Cancer Research UK

Sequencing will get smaller

Personalised medicine needs personalised sequencers.

Sequencing is moving out of centres

- MiSeq and Ion Torrent sequencing machines are appearing in non-specialist labs.
  - Simple(er) to use
  - Built in analysis tools
  - >1Gb throughput
  - cheap
- Sequencers become a common piece of Lab-kit like RT-PCR machines
- ..Lab scientists will have to learn how to analyse the data!!

The future-3rd gen

- Third-gen sequencing
- Single molecule
- Fast
- Cheap

Single Molecule

- Sequencing Without amplification

- Real time sequencing
- Less reagent
- Fewer artifacts
- Promise to be:
  - Faster
  - Cheaper
  - Simpler

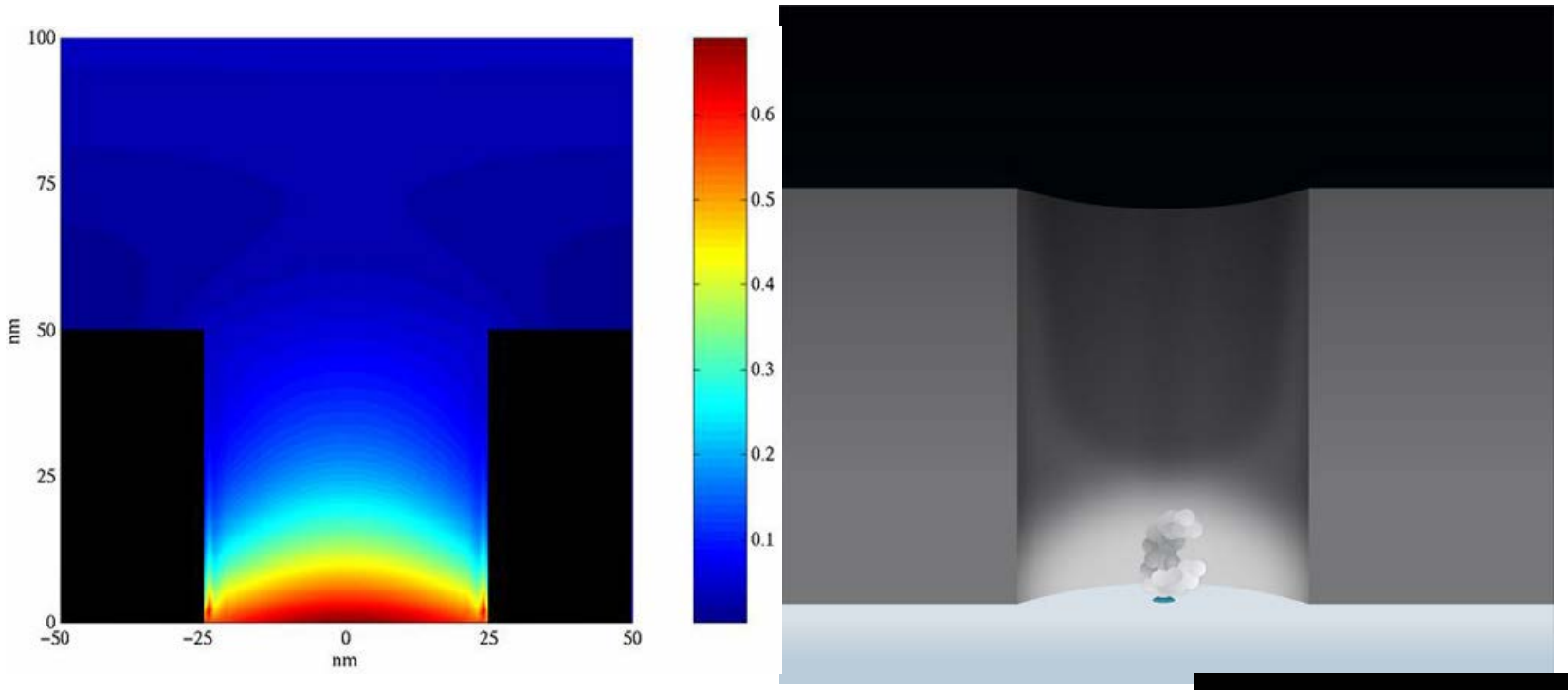
- As yet no instrument has replaced clonal amplification methods

Helicos

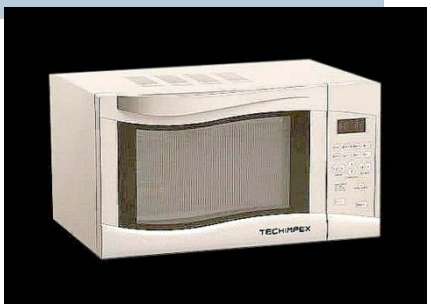
Pac Bio

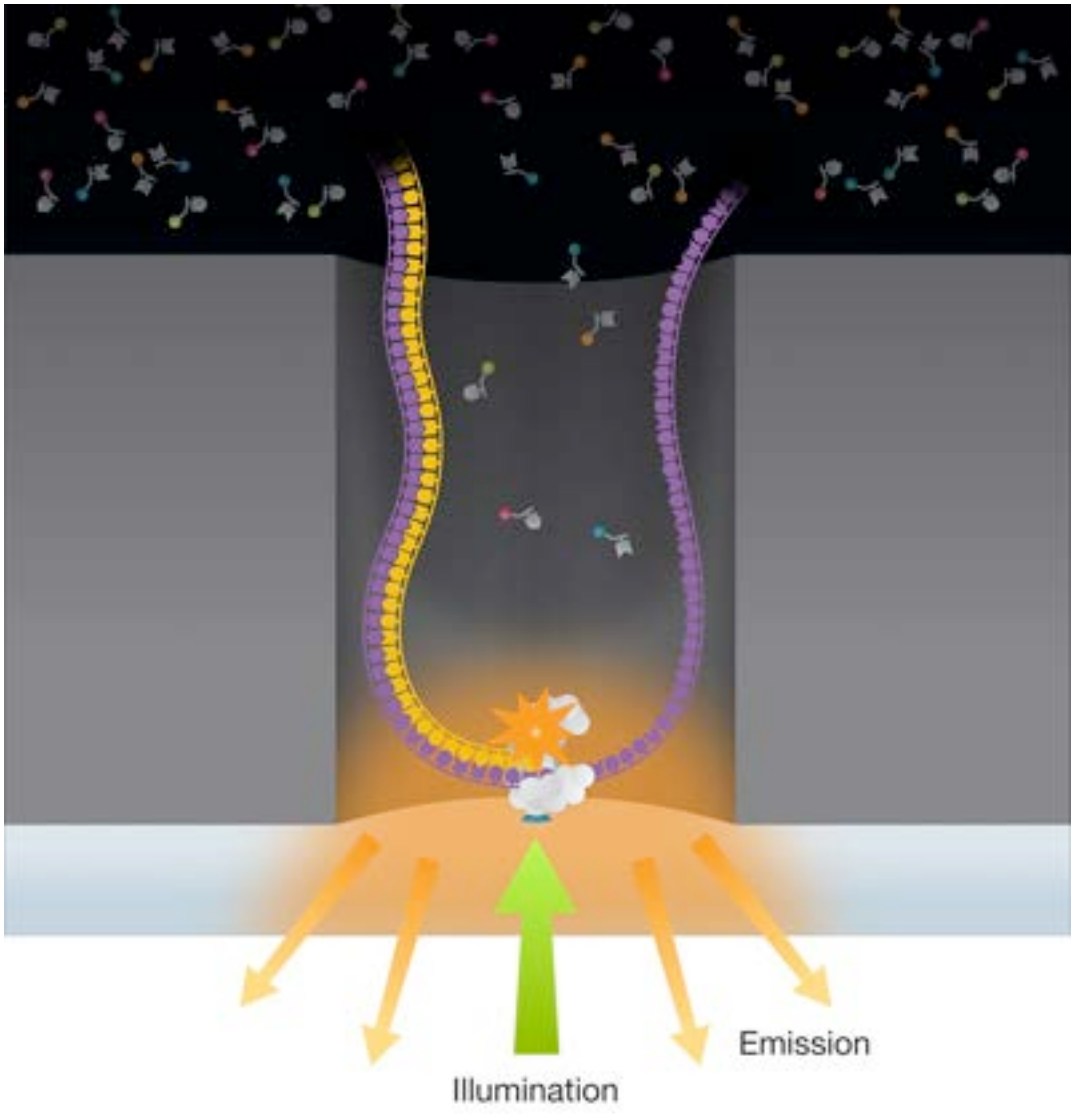
Oxford nanopore

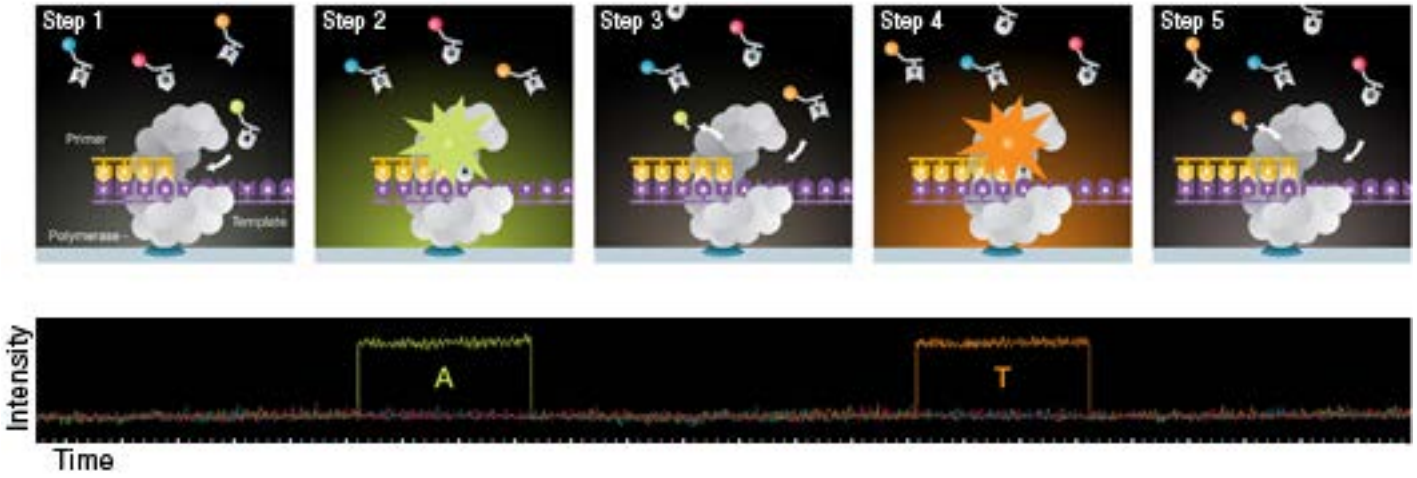
Pacific Biosciences
An example of a third generation technology



The zero mode wave guide




Emission
Illumination



- Long reads > 5kb
- Reqsequencing of circular molecules for accurate reads.

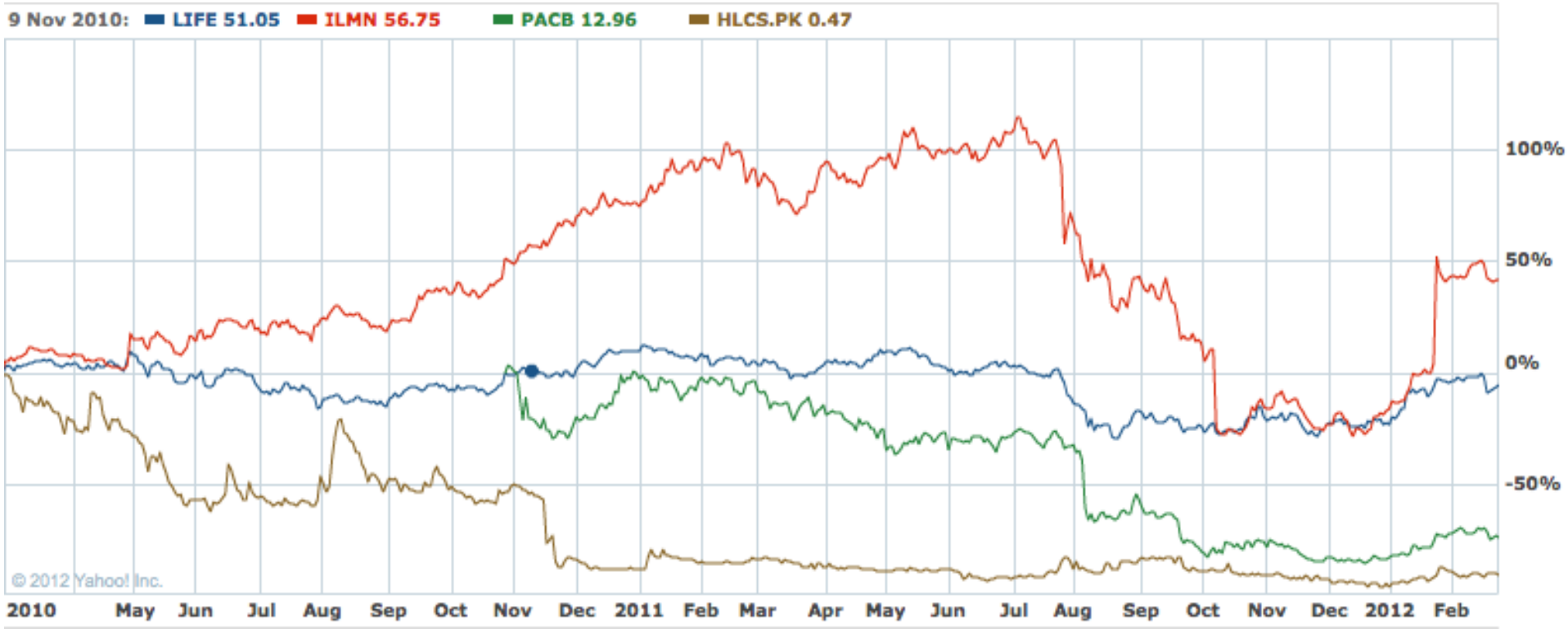
- Rapid sequencing 30bp per molecule per second

- Single molecules… so very lessreagent required
- http://www.pacificbiosciences.com

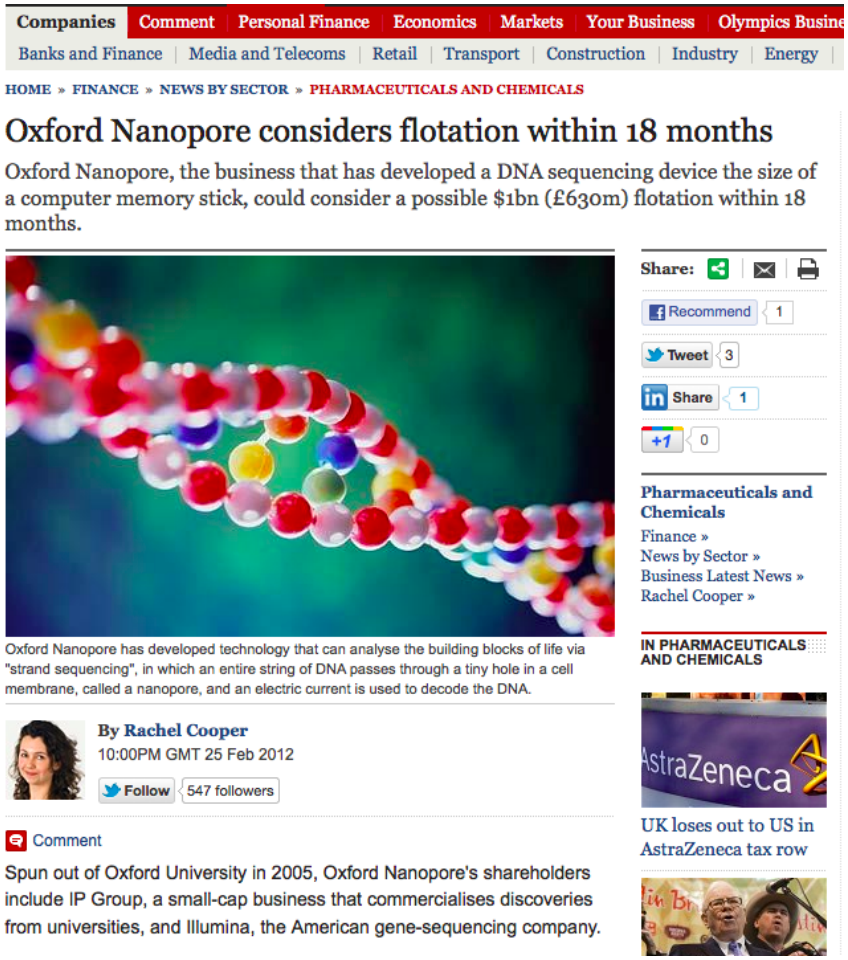
- …however….
- High error rates
- Low throughput

So how good is 3rd gen

Let the markets decide……



The New Next. Next Big Thing: Oxford Nanopore



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Oxford Nanopore considers flotation within 18 months

Oxford Nanopore, the business that has developed a DNA sequencing device the size of a computer memory stick, could consider a possible $1bn (£630m) flotation within 18 months.

Oxford Nanopore has developed technology that can analyse the building blocks of life via "strand sequencing", in which an entire string of DNA passes through a tiny hole in a cell membrane, called a nanopore, and an electric current is used to decode the DNA.

By Rachel Cooper
10:00PM GMT 25 Feb 2012

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Spun out of Oxford University in 2005, Oxford Nanopore's shareholders include IP Group, a small-cap business that commercialises discoveries from universities, and Illumina, the American gene-sequencing company.

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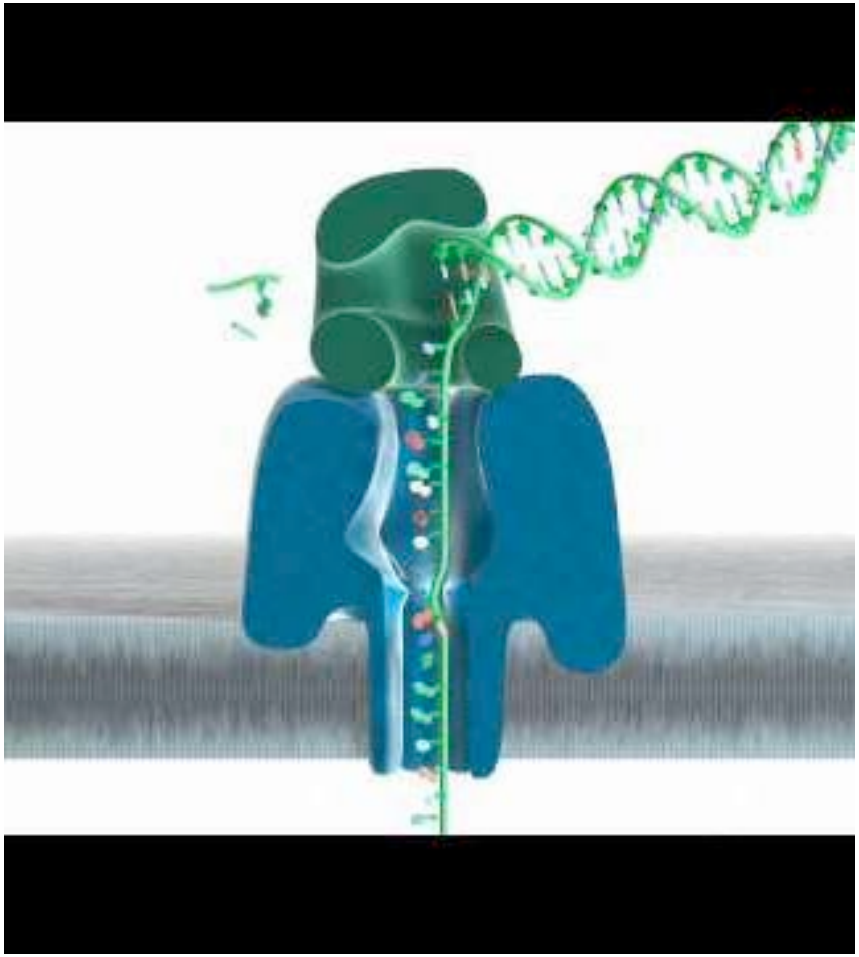
IN PHARMACEUTICALS AND CHEMICALS

UK loses out to US in AstraZeneca tax row

- Developed sequencing method based of feeding DNA through a biological pore.
- Allows very long reads >10kb
- “Relatively accurate” 96%
- Very cheep devices starting at $900



- A artificial membrane separates to solutions at different charges.
- A biological pore sits in the membrane
- As DNA is fed through the pore using “ratcheting enzyme”
- The movement of the DNA changes the current between the two
- Each base triplet creates a different electrical signal

Nanopore sequencing

……potentially very exciting

Oxford Nanopore:

Oxford Nanopore valuation doubles following surprise £31.4m fund-raising

WRITTEN BY LAUTARO VARGAS ON 03 MAY 2012. POSTED IN MEDTECH

16

Oxford Nanopore has announced a surprise £31.4m fundraising, taking the total raised by the Oxford University spin-out since its foundation in 2005 to £105.4m.

Sticking with you: Oxford Nanopore's investors pour in another £31.4m to potentially game-changing sequencing tech

The funding is surprising because the company only raised £25m a year ago, stated on its web site that it wasn't looking for further funding and CEO, Dr Gordon Sanghera, told the Sunday Telegraph just two months ago that the company was well financed for the next stage of growth.

One source told Cabume that the company did not in fact go looking

- No data has been seen by the community yet
- But …
- Has already been successful in generating funding!

Conclusion

- Sequencing will continue to be driven by the clinical investment market
- While markets are convinced that this will generate large revenue there will continue to be well funded development
- So far third generation sequencing has failed to become “mainstream”
- In the short -term we can expect 2nd generation short read sequencing to dominate.

- ….questions

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