

Semi-conductor Sequencing Ion Torrent/Proton Torrent (Life Technologies)

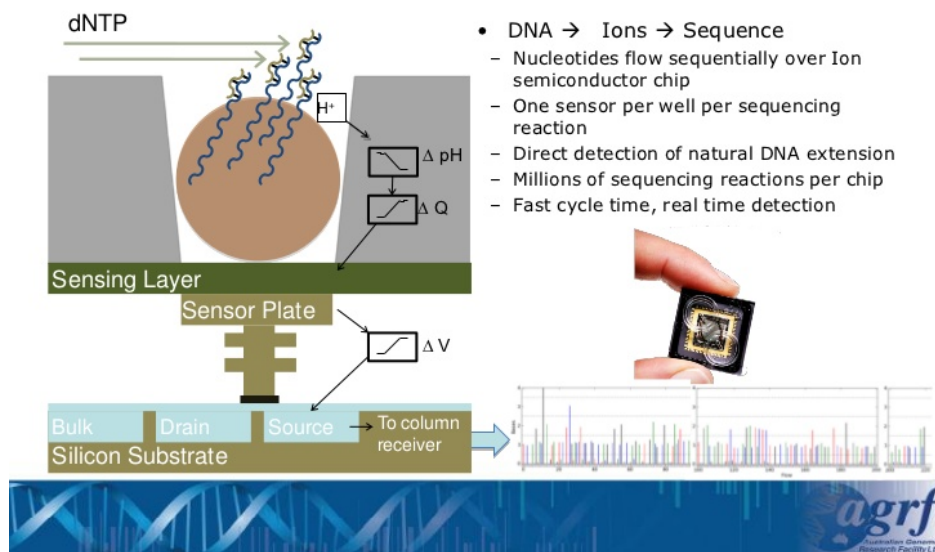
Chemistry

- Similar to 454 technologies
- Template bead is in an emulsion bead that is loaded into a single well
- Sensor detects the release of a hydrogen ion as a nucleotide is inserted into the growing polynucleotide
- Differs from 454 which detects the release of pyrophosphate
 - Nucleotides sequentially washed across the chip
 - If nucleotide is inserted, H⁺ released and pH changes
 - Semi-conductor detects pH changes
 - pH changes indicates number of nucleotides inserted
 - no signal, that base not next in the sequence
 - 2x signal; two of the same base in order

Chip consists of three layers

- Microwells that hold DNA template
- Ion sensitive layer
- Ion detector
 - Small pH meter

Ion Torrent



Semiconductor Sequencing Chips



Chip Types ¹	314	316	318	IP1/IP2/IP3*
# Wells per Chip	1,262,528	6,348,216	11,302,473	165 M/660M/1.2B
Volume, μ L	7	30	30	55
# of Reads ¹	295,736	1,592,020	4,580,123	124-496,000,000
Yield/Q20, bases	24.6/ 21.9 Mb	146.7/ 122.5 Mb	600/ 500 Mb	10 / 60 / 480 Gb
Mean Read ¹ , bp	83	92	129	Up to 300
Longest Reads ¹	396	307	386	640
Run Time ¹ , Hrs	2.4	3.1	4.5	~4
Processing, Hrs ¹	0.3	2.0	4.5	Up to 8 hrs
Analysis ² , Hrs	12	18	30	Up to 1 day
Template Molecules	2.5×10^7	5×10^7	5×10^7	2.5×10^7
Cost per Run	\$400	\$500	\$800	\$1,000

Features of the Life Technologies Instruments

Feature	Ion Torrent PGM	Proton Torrent
Application	Small set of genes Small genomes Gene expression	Whole large genomes Transcriptomes
Throughput	10 Mb - 1 Gb	10 Gb
Read length	35-400 bp	200 bp
# Reads passing filter		60-80 million
Sequencing run time	1.5 hr (100 bp reads)	2-4 hr
Chips	<ul style="list-style-type: none"> • 314 (1 million wells, 10 Mb) • 316 (6 million wells, 100 Mb) • 318 (11 million wells, 1 Gb) 	<ul style="list-style-type: none"> • Proton I (165 million wells; 2 human exomes) • Proton II (600 million wells; 1 human genome)



ION TORRENT



PROTON TORRENT