

# Second Generation Sequencing

Sequencing Machine	ABI 3730	Roche GSFLX	Illumina Solexa	AB SOLiD	Helicos HeliScope	Pacific Bioscience
Launched	2000	2007	2006	2007	2008	2009
Read length (bp)	800-1100	250-400	35-50	25-35	28	?
Reads per run	96	400 K	60 M	85 M	85 M	?
Throughput per run	0.1 MB	100 MB	3 GB	3 GB	2 GB	?
Cost per GB	>\$2500k	\$84k	\$6k	\$5.8k	?	?

# Size comparisons

	bp	distance	me
Solexa read	35	1.9 m	
Sanger read	900	50 m	swimming pool
BAC	120,000	6.7 Km	
rice genome	400,000,000	22,222 Km	distance to UK
canola genome	1,200,000,000	67, 000 Km	



ACPF

# *Brassica* genome sequencing

- A1 UK/China
- A2 Canada
- A3 Korea
- A4 UK/China
- A5 Japan
- A6 India? France?
- A7 Australia?
- A8 UK/China
- A9 Korea
- A10 Canada



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http://www.brassica.info/resource/sequencing/status.php

MBrSP BAC Registry: Chromosome A8 (R8)																
Markers	Position(cM)	Markers	Position(cM)	Bin range	Year	Status	Progress	Genbank No.	Project	date_last_updated						
JVF3p	JVF3p	VCS3MDH	VCS3MDH	CKDH(Korea)	CKDH(UK)	CKDH(UK)	CKDH(UK)									
4	some walking								2007	Phase2	Complete	CU984540	UK-China	3-Dec-08		
5	some walking								2007	Phase2	Complete	CU984561	UK-China	3-Dec-08		
6	KBr009211	89.2							2007	Phase2	complete	not yet submitted	Korea	5-Dec-08		
7	m tiling		KBr003007-6	48.6					2005	Phase3	complete	AC189194	Korea	5-Dec-08		
8	KS40490	77.1							2005	Phase2	complete	AC189202	Korea	3-Dec-08		
9	KS10240	24.9							2005	Phase1	complete	not yet submitted	Korea	5-Dec-08		
10	KS10550	41.8	KS10550	50					2005	Phase2	complete	not yet submitted	Korea	5-Dec-08		
11	KA40700-2	72	KA40700-2	61.2					2008	Phase2	complete	AC189205	Korea	5-Dec-08		
12	some walking								2008	Phase2	Complete	CU740081	UK-China	29-Apr-08		
13	KS10750	91.8							2005	Phase2	complete	AC189228	Korea	5-Dec-08		
14	KS10680-1	60	KA10680-2	54.6					2005	Phase2	complete	AC189240	Korea	3-Dec-08		
15	KS10250	29.3	KS10250	32.3					2005	Phase3	complete	AC172858	Korea	5-Dec-08		
16	KS40210	90.6							2005	Phase2	complete	AC189249	Korea	5-Dec-08		
17	some walking ;								2008	Phase2	Complete	CU695257	UK-China	3-Sep-08		
18	m tiling		KBr0023100-4	51.3					2008	Phase3	complete	AC189271	Korea	3-Dec-08		
19	some walking ;								2008	Phase2	Complete	CU914552	UK-China	3-Sep-08		
20	some walking ;								2008	Phase2	Complete	CU695258	UK-China	3-Sep-08		
21	KS10710	59.1							2005	Phase3	complete	AC189296	Korea	5-Dec-08		
22	some walking								2007	Phase2	complete	CU915247	UK-China	3-Sep-08		
23	KS10160	17.4	KS10160	12.6					2005	Phase3	complete	AC189391	Korea	5-Dec-08		
24	KS10440	36.4	KS10440	44.2					2005	Phase3	complete	AC189346	Korea	5-Dec-08		
25	KA10380-2	48.9							2005	Phase2	complete	AC172861	Korea	5-Dec-08		
26	some walking								2008	Phase2	Complete	CU695262	UK-China	29-Apr-08		
27	KBr046C20	62							2005	Phase3	complete	AC189366	Korea	5-Dec-08		
28	some walking								2008	Phase2	Complete	CU695263	UK-China	29-Apr-08		
29	KS40760-3	74.2							2005	Phase3	complete	AC189375	Korea	3-Dec-08		
30	some walking								2008	Phase2	Complete	CU695264	UK-China	29-Apr-08		
31	KR10610-1a	35.9	KA10610	49.4					2005	Phase3	complete	AC189385	Korea	5-Dec-08		
32	KA10740	128							2005	Phase3	complete	AC189390	Korea	5-Dec-08		
33	KS40300	81							2005	Phase2	complete	AC189398	Korea	5-Dec-08		
34	KR10480-1	44.7							2005	Phase3	complete	AC189405	Korea	3-Dec-08		
35	KA40580-4	69.8							2005	Phase3	complete	AC189407	Korea	5-Dec-08		
36	m tiling		KBr0065D24-5	42					2007	Phase3	complete	not yet submitted	Korea	5-Dec-08		
37	m tiling: previously unassigned, updated Jan 2008								2005	Phase3	complete	not yet submitted	Korea	24-Sep-08		
38	some walking								2008	Phase2	Complete	CU695268	UK-China	29-Apr-08		
39	some walking, confirm		B073C19-4	59.2					2007	Phase2	complete	not yet submitted	Korea	5-Dec-08		
40	KBr0740C23-4	87.6							2005	Phase2	complete	AC189460	Korea	5-Dec-08		
41	KS40480	76.2							2005	Phase3	complete	AC189464	Korea	5-Dec-08		
42	some walking								2008	Phase2	Complete	CU695269	UK-China	29-Apr-08		
43	KS10320	32.5	KS10320	37					2005	Phase2	complete	AC189466	Korea	5-Dec-08		
44	KS10220	24.1							2007	Phase3	complete	not yet submitted	Korea	5-Dec-08		
45	some walking ;								2008	Phase2	Complete	CU695271	UK-China	3-Sep-08		
46	KS40740	73.3	KS40740	63.1					2005	Phase2	complete	AC189517	Korea	5-Dec-08		
47	KR10130-1	0							2005	Phase3	complete	AC189518	Korea	5-Dec-08		
48	m tiling		KS10170	15.2					2005	Phase3	complete	AC189519	Korea	5-Dec-08		
49	some walking								2008	Phase2	Complete	CU695274	UK-China	29-Apr-08		
50	some walking								2008	Phase2	Complete	CU695277	UK-China	29-Apr-08		
51	some walking								2008	Phase2	Complete	CU695280	UK-China	29-Apr-08		
52	some walking								2008	Phase2	Complete	CU928182	UK-China	3-Sep-08		
53	KC10200-3	21.3	KA10200-1	26.7					2007	Phase3	complete	not yet submitted	Korea	5-Dec-08		
54	KR10140-2	11.1							2005	Phase2	complete	AC189533	Korea	5-Dec-08		
55	m tiling ; also mapped		KS40900	58.6					2005	Phase3	complete	AC189541	Korea	5-Dec-08		
56	KS40981	65.1	KS40981	58					2005	Phase3	complete	AC189545	Korea	5-Dec-08		
57	KS40930	66.9							2005	Phase3	complete	AC189549	Korea	5-Dec-08		
58	some walking								2005	Phase2	Complete	CU695289	UK-China	29-Apr-08		
59	m tiling: previously unassigned, updated Jan 2008								2005	Phase2	complete	AC189589	UK-China	24-Jan-08		
60	KS10150	21.9							2005	Phase2	complete	AC189590	Korea	3-Dec-08		
61	KS11010	93.3							2005	Phase3	complete	AC189592	Korea	5-Dec-08		
62	some walking								2008	Phase2	Complete	CU695291	UK-China	29-Apr-08		
63	some walking								2008	Phase2	Complete	CU740085	UK-China	29-Apr-08		
64	some walking								2008	Phase2	Complete	CU914554	UK-China	30-Jun-08		
65	some walking								2008	Phase2	Complete	CU695345	UK-China	29-Apr-08		
66	some walking								2008	Phase2	Complete	CU928184	UK-China	3-Sep-08		
67	some walking								2008	Phase2	Complete	CU695293	UK-China	29-Apr-08		
68	some walking								2008	Phase2	Complete	CU695296	UK-China	29-Apr-08		



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# New Chinese Initiative

Institute of Vegetables  
and Flowers (IVF)



Oil Crops Research  
Institute (OCRI) CAAS



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**Hanzhong Wang,  
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**Shengyi Liu**

**Peixiang Ni,  
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**Ruiqiang Li**

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**Korea: Beom-Seok Park, Yong Pyo Lim**

**UK: Ian Bancroft**

**Canada: Isobel Parkin**

**Australia: David Edwards**

**The Netherlands: Guusje Bonnema, Mark Aarts**



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~50x coverage Illumina short reads

## Contigs without N

- Longest = 45,025 bp
- N50 = 4,342 bp

## Scaffolds containing N

- Longest = 293,912 bp
- N50 = 30,723 bp



# Change of plan for completion

- Sequence BACs to phase 1, use paired read data to finish to phase 3
- Focus on assigned chromosomes but also sequence and map BACs from chromosomes 7 (and 6?)



# New data, new capabilities

- Shotgun sequence *B. oleracea* and *B. napus*?
- Re-sequence different varieties to identify SNPs?
- Identify all gene variants in the genome and compare between genomes



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# GRDC related projects

## **ARC Linkage: Bayer CropScience**

**Developing technology for the cost effective *de novo* sequencing and analysis of complex genomes.**

## **ARC Linkage: Bayer CropScience and DPI NWS**

**Characterising genetic variation in *Brassica napus*.**

## **ARC Linkage: Biomatters Ltd.**

**Next generation metagenomics.**

## **ARC Discovery: Jacqueline Batley and Regine Delourme**

**Co-evolution of the host pathogen interaction between *Leptosphaeria maculans* and Brassica species.**



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