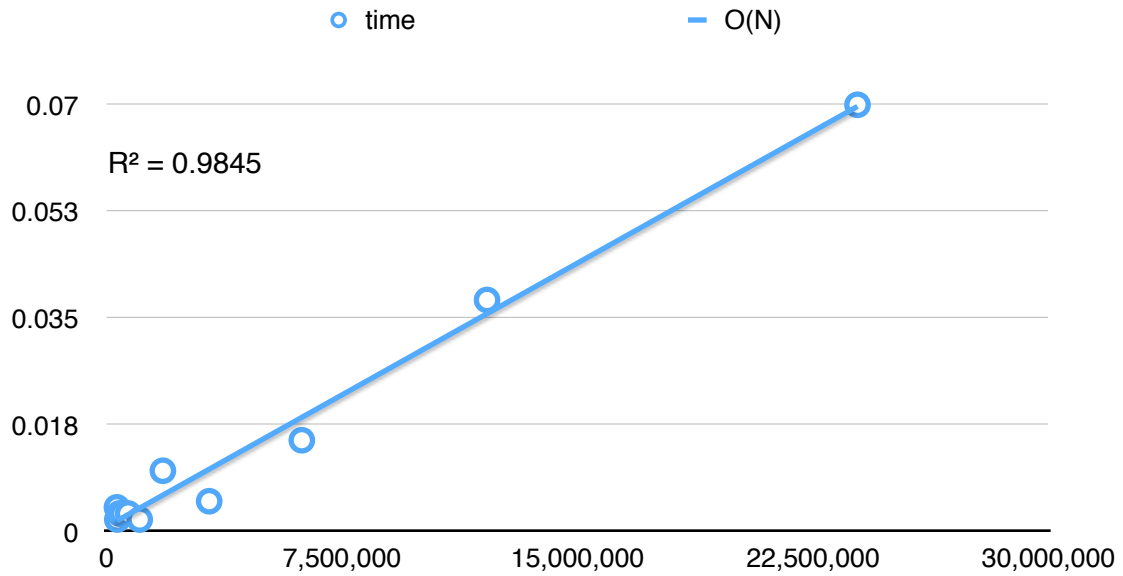
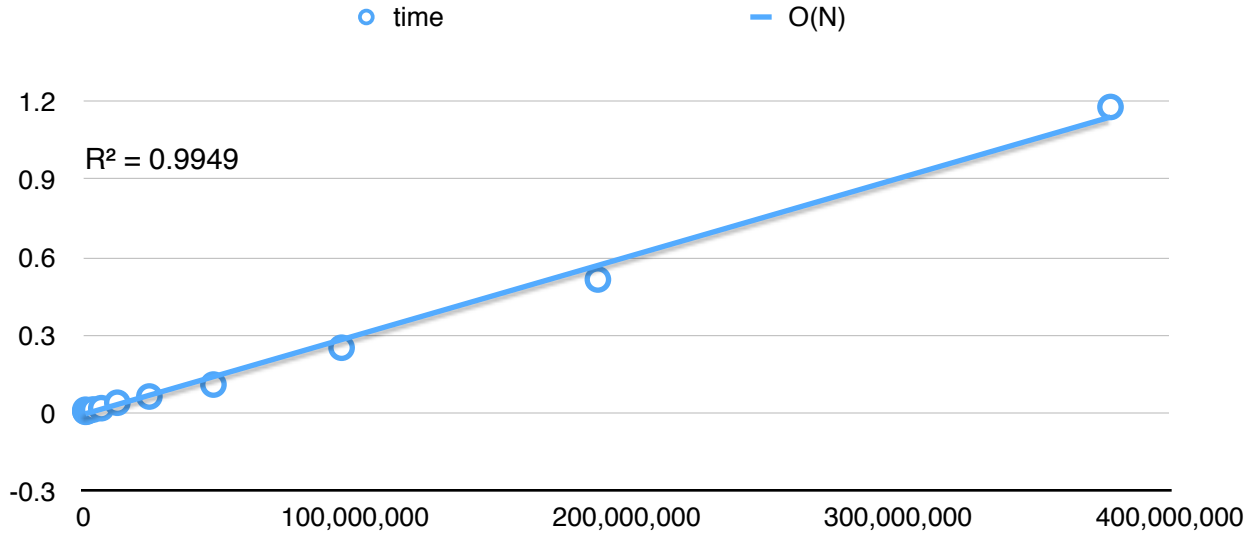


Part 1A  
ecoli\_small.txt (copied once)



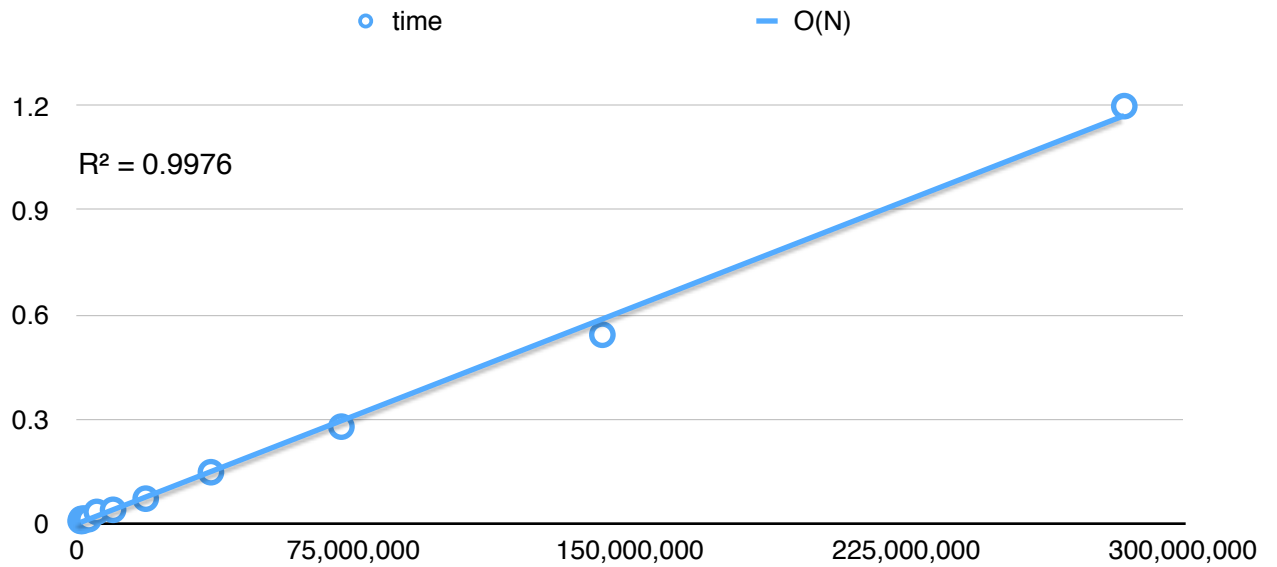
	Class	splicee	recomb	time	append calls
	SimpleStrand:	256	331,410	0.004	90
	SimpleStrand:	512	342,930	0.002	90
	SimpleStrand:	1,024	365,970	0.002	90
	SimpleStrand:	2,048	412,050	0.003	90
	SimpleStrand:	4,096	504,210	0.003	90
	SimpleStrand:	8,192	688,530	0.003	90
	SimpleStrand:	16,384	1,057,170	0.002	90
	SimpleStrand:	32,768	1,794,450	0.010	90
	SimpleStrand:	65,536	3,269,010	0.005	90
	SimpleStrand:	131,072	6,218,130	0.015	90
	SimpleStrand:	262,144	12,116,370	0.038	90
	SimpleStrand:	524,288	23,912,850	0.070	90

ecoli\_small2.txt (copied twice)



Class	splicee	recomb	time	append calls
SimpleStrand:	256	662,820	0.006	180
SimpleStrand:	512	685,860	0.012	180
SimpleStrand:	1,024	731,940	0.004	180
SimpleStrand:	2,048	824,100	0.004	180
SimpleStrand:	4,096	1,008,420	0.005	180
SimpleStrand:	8,192	1,377,060	0.006	180
SimpleStrand:	16,384	2,114,340	0.010	180
SimpleStrand:	32,768	3,588,900	0.013	180
SimpleStrand:	65,536	6,538,020	0.018	180
SimpleStrand:	131,072	12,436,260	0.039	180
SimpleStrand:	262,144	24,232,740	0.063	180
SimpleStrand:	524,288	47,825,700	0.109	180
SimpleStrand:	1,048,576	95,011,620	0.251	180
SimpleStrand:	2,097,152	189,383,460	0.514	180
SimpleStrand:	4,194,304	378,127,140	1.179	180

ecoli\_small3.txt (copied three times)



	Class	splicee	recomb	time	append calls
	SimpleStrand:	256	994,230	0.007	270
	SimpleStrand:	512	1,028,790	0.008	270
	SimpleStrand:	1,024	1,097,910	0.006	270
	SimpleStrand:	2,048	1,236,150	0.013	270
	SimpleStrand:	4,096	1,512,630	0.007	270
	SimpleStrand:	8,192	2,065,590	0.014	270
	SimpleStrand:	16,384	3,171,510	0.012	270
	SimpleStrand:	32,768	5,383,350	0.033	270
	SimpleStrand:	65,536	9,807,030	0.039	270
	SimpleStrand:	131,072	18,654,390	0.071	270
	SimpleStrand:	262,144	36,349,110	0.147	270
	SimpleStrand:	524,288	71,738,550	0.278	270
	SimpleStrand:	1,048,576	142,517,430	0.542	270
	SimpleStrand:	2,097,152	284,075,190	1.199	270

Accompanied with the data provided by 3 runs of DNABenchmark, above are three graphs that display data collected from the runs on 3 text files: one with `ecoli_small.txt` copied once, one with `ecoli_small.txt` copied twice, and one with `ecoli_small.txt` copied three times. Time is displayed on the Y-axis, and number of recombinations on the X-axis. The  $R^2$  values, which can be found on the graphs themselves, hover just below one, which supports the claim that `cutAndSplice` for `SimpleStrand` should run in  $O(N)$  time. Because a `StringBuilder` is being used, the time it takes for the `String` to be constructed is dependent upon its length, so the larger the `String` to be constructed, the longer the `StringBuilder` takes.

## Part 1B

Max heap size was 4096MB. I determined the max amount by simple trial and error. It took a total of 2.401 seconds an the largest splicee is of length 524,288.

	Class	splicee	recomb	time	append calls
	-----				
	SimpleStrand:	256	4,800,471	0.031	1290
	SimpleStrand:	512	4,965,591	0.049	1290
	SimpleStrand:	1,024	5,295,831	0.041	1290
	SimpleStrand:	2,048	5,956,311	0.031	1290
	SimpleStrand:	4,096	7,277,271	0.040	1290
	SimpleStrand:	8,192	9,919,191	0.032	1290
	SimpleStrand:	16,384	15,203,031	0.061	1290
	SimpleStrand:	32,768	25,770,711	0.103	1290
	SimpleStrand:	65,536	46,906,071	0.149	1290
	SimpleStrand:	131,072	89,176,791	0.291	1290
	SimpleStrand:	262,144	173,718,231	0.410	1290
	SimpleStrand:	524,288	342,801,111	1.163	1290
<b>TOTAL TIME</b>				2.401	

## Part 2

ecoli\_small.txt (copied once)

Class	splicee	recomb	time	append calls
LinkStrand:	256	331,410	0.003	90
LinkStrand:	512	342,930	0.003	90
LinkStrand:	1,024	365,970	0.003	90
LinkStrand:	2,048	412,050	0.002	90
LinkStrand:	4,096	504,210	0.002	90
LinkStrand:	8,192	688,530	0.002	90
LinkStrand:	16,384	1,057,170	0.003	90
LinkStrand:	32,768	1,794,450	0.003	90
LinkStrand:	65,536	3,269,010	0.002	90
LinkStrand:	131,072	6,218,130	0.002	90
LinkStrand:	262,144	12,116,370	0.001	90
LinkStrand:	524,288	23,912,850	0.003	90
LinkStrand:	1,048,576	47,505,810	0.002	90
LinkStrand:	2,097,152	94,691,730	0.002	90
LinkStrand:	4,194,304	189,063,570	0.002	90
LinkStrand:	8,388,608	377,807,250	0.003	90
LinkStrand:	16,777,216	755,294,610	0.001	90
LinkStrand:	33,554,432	1,510,269,330	0.001	90
LinkStrand:	67,108,864	3,020,218,770	0.002	90
LinkStrand:	134,217,728	6,040,117,650	0.002	90
LinkStrand:	268,435,456	12,079,915,410	0.002	90
LinkStrand:	536,870,912	24,159,510,930	0.001	90

ecoli\_small2.txt (copied twice)

Class	splicee	recomb	time	append calls
LinkStrand:	256	662,820	0.005	180
LinkStrand:	512	685,860	0.010	180
LinkStrand:	1,024	731,940	0.005	180
LinkStrand:	2,048	824,100	0.004	180
LinkStrand:	4,096	1,008,420	0.004	180
LinkStrand:	8,192	1,377,060	0.009	180
LinkStrand:	16,384	2,114,340	0.003	180
LinkStrand:	32,768	3,588,900	0.005	180
LinkStrand:	65,536	6,538,020	0.004	180
LinkStrand:	131,072	12,436,260	0.005	180
LinkStrand:	262,144	24,232,740	0.003	180
LinkStrand:	524,288	47,825,700	0.004	180
LinkStrand:	1,048,576	95,011,620	0.010	180
LinkStrand:	2,097,152	189,383,460	0.004	180
LinkStrand:	4,194,304	378,127,140	0.005	180
LinkStrand:	8,388,608	755,614,500	0.004	180
LinkStrand:	16,777,216	1,510,589,220	0.003	180
LinkStrand:	33,554,432	3,020,538,660	0.003	180
LinkStrand:	67,108,864	6,040,437,540	0.003	180
LinkStrand:	134,217,728	12,080,235,300	0.003	180
LinkStrand:	268,435,456	24,159,830,820	0.003	180
LinkStrand:	536,870,912	48,319,021,860	0.003	180

ecoli\_small3.txt (copied three times)

Class	splicee	recomb	time	append calls
LinkStrand:	256	994,230	0.008	270
LinkStrand:	512	1,028,790	0.007	270
LinkStrand:	1,024	1,097,910	0.007	270
LinkStrand:	2,048	1,236,150	0.007	270
LinkStrand:	4,096	1,512,630	0.007	270
LinkStrand:	8,192	2,065,590	0.006	270
LinkStrand:	16,384	3,171,510	0.006	270
LinkStrand:	32,768	5,383,350	0.015	270
LinkStrand:	65,536	9,807,030	0.006	270
LinkStrand:	131,072	18,654,390	0.006	270
LinkStrand:	262,144	36,349,110	0.009	270
LinkStrand:	524,288	71,738,550	0.009	270
LinkStrand:	1,048,576	142,517,430	0.013	270
LinkStrand:	2,097,152	284,075,190	0.005	270
LinkStrand:	4,194,304	567,190,710	0.007	270
LinkStrand:	8,388,608	1,133,421,750	0.006	270
LinkStrand:	16,777,216	2,265,883,830	0.005	270
LinkStrand:	33,554,432	4,530,807,990	0.005	270
LinkStrand:	67,108,864	9,060,656,310	0.005	270
LinkStrand:	134,217,728	18,120,352,950	0.007	270
LinkStrand:	268,435,456	36,239,746,230	0.005	270
LinkStrand:	536,870,912	72,478,532,790	0.006	270



ecoli\_small4.txt (copied four times)

Class	splicee	recomb	time	append calls
-----				
LinkStrand:	256	1,325,640	0.010	360
LinkStrand:	512	1,371,720	0.014	360
LinkStrand:	1,024	1,463,880	0.010	360
LinkStrand:	2,048	1,648,200	0.009	360
LinkStrand:	4,096	2,016,840	0.015	360
LinkStrand:	8,192	2,754,120	0.009	360
LinkStrand:	16,384	4,228,680	0.008	360
LinkStrand:	32,768	7,177,800	0.013	360
LinkStrand:	65,536	13,076,040	0.008	360
LinkStrand:	131,072	24,872,520	0.009	360
LinkStrand:	262,144	48,465,480	0.012	360
LinkStrand:	524,288	95,651,400	0.007	360
LinkStrand:	1,048,576	190,023,240	0.007	360
LinkStrand:	2,097,152	378,766,920	0.012	360
LinkStrand:	4,194,304	756,254,280	0.009	360
LinkStrand:	8,388,608	1,511,229,000	0.008	360
LinkStrand:	16,777,216	3,021,178,440	0.033	360
LinkStrand:	33,554,432	6,041,077,320	0.011	360
LinkStrand:	67,108,864	12,080,875,080	0.007	360
LinkStrand:	134,217,728	24,160,470,600	0.008	360
LinkStrand:	268,435,456	48,319,661,640	0.007	360
LinkStrand:	536,870,912	96,638,043,720	0.009	360

ecoli\_small5.txt (copied five times)

Class	splicee	recomb	time	append calls
-----				
LinkStrand:	256	1,657,050	0.009	450
LinkStrand:	512	1,714,650	0.011	450
LinkStrand:	1,024	1,829,850	0.011	450
LinkStrand:	2,048	2,060,250	0.028	450
LinkStrand:	4,096	2,521,050	0.013	450
LinkStrand:	8,192	3,442,650	0.013	450
LinkStrand:	16,384	5,285,850	0.010	450
LinkStrand:	32,768	8,972,250	0.016	450
LinkStrand:	65,536	16,345,050	0.009	450
LinkStrand:	131,072	31,090,650	0.013	450
LinkStrand:	262,144	60,581,850	0.011	450
LinkStrand:	524,288	119,564,250	0.012	450
LinkStrand:	1,048,576	237,529,050	0.016	450
LinkStrand:	2,097,152	473,458,650	0.009	450
LinkStrand:	4,194,304	945,317,850	0.009	450
LinkStrand:	8,388,608	1,889,036,250	0.009	450
LinkStrand:	16,777,216	3,776,473,050	0.009	450
LinkStrand:	33,554,432	7,551,346,650	0.009	450
LinkStrand:	67,108,864	15,101,093,850	0.009	450
LinkStrand:	134,217,728	30,200,588,250	0.013	450
LinkStrand:	268,435,456	60,399,577,050	0.009	450
LinkStrand:	536,870,912	120,797,554,650	0.010	450

This is an accompanying graph that compares average time (Y-axis) against number of breaks (X-axis). The  $R^2$  value for the above graph is .9819. The running time is dependent upon the number of breaks where the enzyme is found and the splicee replaces it. Unlike the StringBuilder, length does not matter- only the amount of breaks when the enzyme is replaced.

