Supplementary Information

List of experiments

no	name	AC	lin12	lin15	Vul	lst	dpy23	let60	lin3	mir61	unk
1	wild-type										
2	lstko					0	0				
3	Vulko				0						
4	Vulkolstko				0	0	0				
5	lin15ko			0							
6	lin15kolstko			0		0	0				
7	lin15koVulko			0	0						
8	lin15koVulkolstko			0	0	0	0				
9	lin12ko		0								
10	lin12kolstko		0			0	0				
11	Vulkolin12ko		0		0						
12	lin12koVulkolstko		0		0	0	0				
13	lin15kolin12ko		0	0							
14	lin12kolin15kolstko		0	0		0	0				
15	lin12kolin15koVulko		0	0	0						
16	lin12kolin15koVulkolstko		gf	0	0	0	0				
17	lin12d		gf								
18	lin12dlstko		gf			0	0				
19	Vulkolin12d		gf		0						
20	lin12dVulkolstko		gf		0	0	0				
21	lin15kolin12d		gf	0							
22	lin12dlin15kolstko		gf	0		0	0				
23	lin12dlin15koVulko		gf	0	0						
24	lin12dlin15koVulkolstko		gf	0	0	0	0				
25	ac-	Abl									
26	ac-lstko	Abl				0	0				
27	ac-Vulko	Abl			0						
28	ac-Vulkolstko	Abl			0	0	0				
29	ac-lin15ko	Abl		0							
30	ac-lin15kolstko	Abl		0		0	0				
31	ac-lin15koVulko	Abl		0	0						
32	ac-lin15koVulkolstko	Abl		0	0	0	0				
33	ac-lin12ko	Abl	0								
34	ac-lin12kolstko	Abl	0			0	0				
35	ac-Vulkolin12ko	Abl	0		0						
36	ac-lin12koVulkolstko	Abl	0		0	0	0				
37	ac-lin15kolin12ko	Abl	0	0							
38	ac-lin12kolin15kolstko	Abl	0	0		0	0				
39	ac-lin12kolin15koVulko	Abl	0	0	0						
40	ac-lin12kolin15koVulkolstko	Abl	gf	0	0	0	0				
41	ac-lin12d	Abl	gf								
42	ac-lin12dlstko	Abl	gf			0	0				
43	ac-Vulkolin12d	Abl	gf		0						

44	ac-lin12dVulkolstko	Abl	gf		0	0	0				
45	ac-lin15kolin12d	Abl	gf	0							
46	ac-lin12dlin15kolstko	Abl	gf	0		0	0				
47	ac-lin12dlin15koVulko	Abl	gf	0	0						
48	ac-lin12dlin15koVulkolstko	Abl	gf	0	0	0	0				
49	let60							0			
50	lin3								0		
51	lin3d								gf		
52	mir61ce									ce	
53	ac-mir61ce	Abl								ce	
54	mir61ceVulko				0					ce	
55	mir61celstko					0	0			ce	
56	mir61kolstko					0	0			0	
57	mir61kovav1ko									0	
58	dpy23ko						0				
59	lstOnlyko					0					
60	mir61cedpy23ko						0			ce	
61	mir61celstOnlyko					0				ce	
62	mir61kodpy23ko						0			0	
63	mir61kolstOnlyko					0				0	
64	unkko										0

Legend: Genes and groups and groups of genes:

- **AC**, Anchor Cell: Can be present (no mark) or ablated (Abl).
- **lin-12** gene: Can be wild-type (no mark) or knocked out (0) or over-expressed (gf).
- **lin-15** gene: Can be wild-type (no mark) or knocked out (0).
- **Vul** set of genes: let-23, sem-5, let-60 and mpk-1: Can be wild-type (no mark) or knocked out (0).
- **lst** set of genes: lip-1, lst-1, lst-2, lst-3 and lst-4: Can be wild-type (no mark) or knocked out (0).
- **dpy-23** set of genes: dpy-23 and ark-1: Can be wild-type (no mark) or knocked out (0).
- **let-60** gene: Can be wild-type (no mark) or knocked out (0).
- **lin-3** gene: Can be wild-type (no mark) or knocked out (0) or over-expressed (gf).
- **mir-61**, a microRNA gene: Can be wild-type (no mark), knocked out (0) or constitutively expressed (ce).
- **unk**, an (unknown) gene, downregulating LIN-12: Can be wild-type (no mark) or knocked out (0).

First 48 experiments correspond to those published by J. Fisher, N. Piterman, A. Hajnal and T. Henzinger in *Predictive Modeling of Signaling Crosstalk during C. elegans Vulval Development*, PLoS Computational Biology, 2007. As intuitive mesure of running time, performing 10 simulation runs of the wild-type genetic background takes 40 seconds on a AMD Athlon(tm) 64 X2 Dual Core Processor 4400+ with 1GB of total memory running Linux 2.6.27.

Experiment 1 **:** wild-type

PATTERN	OCC.	%
3 3 2 1 2 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 2 **:** lstko

PATTERN	OCC.	%
3 3 1 1 1 3	4800	96.000 %
3 3 1 1 1 2	199	3.980 %
3 3 1 1 3 2	1	0.020 %
– Sum –	5000	100.000 %

Experiment 3 **:** Vulko

PATTERN	OCC.	%
3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 4 **:** Vulkolstko

PATTERN	OCC.	%
3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 5 **:** lin15ko

PATTERN	OCC.	%
2 1 2 1 2 1	1277	25.540 %
1 2 2 1 2 1	1173	23.460 %
2 1 2 1 2 2	933	18.660 %
1 2 2 1 2 2	888	17.760 %
2 2 2 1 2 1	163	3.260 %
2 2 2 1 2 2	90	1.800 %
1 1 2 1 2 1	74	1.480 %
2 3 2 1 2 1	60	1.200 %
2 1 2 1 2 3	56	1.120 %
1 2 2 1 2 3	55	1.100 %
1 1 2 1 2 2	34	0.680 %
2 3 2 1 2 2	33	0.660 %
1 3 2 1 2 1	27	0.540 %
3 1 2 1 2 1	25	0.500 %
3 2 2 1 2 1	20	0.400 %
3 2 2 1 2 2	18	0.360 %
3 3 2 1 2 1	18	0.360 %
1 3 2 1 2 2	14	0.280 %
3 1 2 1 2 2	11	0.220 %
2 2 2 1 2 3	9	0.180 %
3 3 2 1 2 2	6	0.120 %
1 1 2 1 2 3	5	0.100 %
2 3 2 1 2 3	3	0.060 %
3 3 2 1 2 3	3	0.060 %
1 3 2 1 2 3	2	0.040 %
3 1 2 1 2 3	2	0.040 %
3 2 2 1 2 3	1	0.020 %
– Sum –	5000	100.000 %

Experiment 6 **:** lin15kolstko

PATTERN	OCC.	%
1 1 1 1 1 1	4981	99.620 %
1 1 1 1 1 3	9	0.180 %
1 3 1 1 1 1	5	0.100 %
3 1 1 1 1 1	5	0.100 %
– Sum –	5000	100.000 %

Experiment 7 **:** lin15koVulko

PATTERN	OCC.	%
3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 8 **:** lin15koVulkolstko

PATTERN	OCC.	%
3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 9 **:** lin12ko

PATTERN	OCC.	%
3 3 1 1 1 3	4931	98.620 %
3 3 3 1 1 3	36	0.720 %
3 3 1 1 3 3	33	0.660 %
– SUM –	5000	100.000 %

Experiment 10 **:** lin12kolstko

PATTERN	OCC.	%
3 3 1 1 1 3	5000	100.000 %
– SUM –	5000	100.000 %

Experiment 11 **:** Vulkolin12ko

PATTERN	OCC.	%
3 3 3 3 3 3	5000	100.000 %
– SUM –	5000	100.000 %

Experiment 12 **:** lin12koVulkolstko

PATTERN	OCC.	%
3 3 3 3 3 3	5000	100.000 %
– SUM –	5000	100.000 %

Experiment 13 **:** lin15kolin12ko

PATTERN	OCC.	%
1 1 1 1 1 1	4904	98.080 %
1 1 1 1 1 3	36	0.720 %
1 3 1 1 1 1	34	0.680 %
3 1 1 1 1 1	26	0.520 %
– SUM –	5000	100.000 %

Experiment 14 **:** lin12kolin15kolstko

PATTERN	OCC.	%
1 1 1 1 1 1	5000	100.000 %
– SUM –	5000	100.000 %

Experiment 15 **:** lin12kolin15koVulko

PATTERN	OCC.	%
3 3 3 3 3 3	5000	100.000 %
– SUM –	5000	100.000 %

Experiment 16 **:** lin12kolin15koVulkolstko

PATTERN	OCC.	%
3 3 3 3 3 3	5000	100.000 %
– SUM –	5000	100.000 %

Experiment 17 **:** lin12d

PATTERN	OCC.	%
2 2 2 2 2 2	4156	83.120 %
2 2 2 1 2 2	567	11.340 %
2 2 2 2 3 2	42	0.840 %
2 2 2 2 2 3	39	0.780 %
2 3 2 2 2 2	38	0.760 %
3 2 2 2 2 2	37	0.740 %
2 2 2 3 2 2	37	0.740 %
2 2 3 2 2 2	34	0.680 %
2 2 1 2 2 2	10	0.200 %
2 3 2 1 2 2	8	0.160 %
2 2 2 1 3 2	7	0.140 %
2 2 3 1 2 2	7	0.140 %
2 2 2 1 2 3	5	0.100 %
3 2 2 1 2 2	5	0.100 %
2 2 2 2 1 2	3	0.060 %
2 3 2 2 2 3	2	0.040 %
2 3 2 2 1 2	1	0.020 %
2 2 1 3 2 2	1	0.020 %
3 2 3 2 2 2	1	0.020 %
– SUM –	5000	100.000 %

Experiment 18 **:** lin12dlstko

pattern	occ.	%
2 2 1 1 1 2	4998	99.960 %
2 3 1 1 1 2	2	0.040 %
– Sum –	5000	100.000 %

Experiment 19 **:** Vulkolin12d

pattern	occ.	%
2 2 2 2 2 2	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 20 **:** lin12dVulkolstko

pattern	occ.	%
2 2 2 2 2 2	4999	99.980 %
3 2 2 2 2 2	1	0.020 %
– Sum –	5000	100.000 %

Experiment 21 **:** lin15kolin12d

pattern	occ.	%
2 2 2 2 2 2	3378	67.560 %
2 2 2 1 2 2	758	15.160 %
2 2 1 2 2 2	568	11.360 %
2 2 2 2 2 3	39	0.780 %
2 2 2 3 2 2	36	0.720 %
2 2 3 2 2 2	30	0.600 %
3 2 2 2 2 2	29	0.580 %
2 2 2 2 3 2	27	0.540 %
2 3 2 2 2 2	26	0.520 %
2 2 2 2 2 1	21	0.420 %
2 3 2 1 2 2	15	0.300 %
1 2 2 2 2 2	9	0.180 %
3 2 2 1 2 2	8	0.160 %
3 2 1 2 2 2	8	0.160 %
2 2 2 1 3 2	8	0.160 %
2 3 1 2 2 2	7	0.140 %
2 2 3 1 2 2	7	0.140 %
2 2 1 2 2 3	6	0.120 %
2 2 1 3 2 2	5	0.100 %
2 2 1 2 3 2	5	0.100 %
2 2 2 1 2 3	4	0.080 %
2 2 3 2 2 3	2	0.040 %
2 2 3 3 2 2	1	0.020 %
2 3 2 2 2 3	1	0.020 %
2 3 2 3 2 2	1	0.020 %
3 3 2 2 2 2	1	0.020 %
– Sum –	5000	100.000 %

Experiment 22 **:** lin12dlin15kolstko

pattern	occ.	%
1 1 1 1 1 1	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 23 **:** lin12dlin15koVulko

pattern	occ.	%
2 2 2 2 2 2	4999	99.980 %
2 2 2 2 2 3	1	0.020 %
– Sum –	5000	100.000 %

Experiment 24 **:**
lin12dlin15koVulkolstko

pattern	occ.	%
2 2 2 2 2 2	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 25 **:** ac-

pattern	occ.	%
3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 26 **:** ac-lstko

pattern	occ.	%

3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 27 : ac-Vulko

PATTERN	OCC.	%
3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 28 : ac-Vulkolstko

PATTERN	OCC.	%
3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 29 : ac-lin15ko

PATTERN	OCC.	%
1 2 1 2 1 2	1098	21.960 %
2 1 2 1 2 1	957	19.140 %
2 1 2 1 2 2	428	8.560 %
2 2 1 2 1 2	389	7.780 %
1 2 2 1 2 1	225	4.500 %
1 2 1 2 2 1	215	4.300 %
2 2 1 2 2 1	124	2.480 %
2 2 2 2 2 1	118	2.360 %
1 1 2 1 2 1	111	2.220 %
1 2 2 2 1 2	103	2.060 %
1 2 2 1 2 2	88	1.760 %
1 2 2 2 2 2	88	1.760 %
2 1 2 2 2 1	85	1.700 %
1 2 2 2 2 1	77	1.540 %
2 1 2 2 1 2	64	1.280 %
2 2 2 1 2 1	52	1.040 %
2 1 2 1 2 3	44	0.880 %
2 2 1 2 1 1	43	0.860 %
3 2 1 2 1 2	42	0.840 %
1 2 1 2 2 2	29	0.580 %
2 1 2 2 2 2	27	0.540 %
1 2 3 2 1 2	27	0.540 %
2 2 2 2 1 2	26	0.520 %
1 1 2 1 2 2	23	0.460 %
2 1 2 3 2 1	21	0.420 %
1 2 2 3 2 2	20	0.400 %
2 2 1 2 3 1	17	0.340 %
1 2 1 2 1 1	16	0.320 %
2 2 3 2 2 1	16	0.320 %
2 3 2 2 2 1	16	0.320 %
3 2 2 1 2 1	15	0.300 %
2 1 2 3 2 2	15	0.300 %
2 2 3 2 1 2	14	0.280 %
1 1 2 2 2 1	14	0.280 %
3 1 2 1 2 2	14	0.280 %
1 2 3 2 2 1	13	0.260 %
2 3 2 1 2 1	12	0.240 %
2 1 2 2 3 2	11	0.220 %
1 2 2 1 2 3	11	0.220 %
2 2 1 2 2 2	10	0.200 %
1 2 1 2 3 2	10	0.200 %
3 2 1 2 2 1	10	0.200 %
1 3 2 1 2 2	10	0.200 %
2 3 2 2 1 2	10	0.200 %
3 1 2 1 2 1	9	0.180 %
1 2 1 1 2 1	9	0.180 %
2 2 2 2 2 2	8	0.160 %
1 2 2 3 2 1	8	0.160 %
1 2 1 2 1 3	7	0.140 %
1 2 1 2 3 3	7	0.140 %
1 2 2 2 1 1	7	0.140 %
2 2 1 2 1 3	7	0.140 %
1 1 2 1 2 3	6	0.120 %
2 2 1 2 3 3	6	0.120 %
1 2 3 3 2 1	6	0.120 %
3 3 2 1 2 1	6	0.120 %
2 3 2 1 2 2	5	0.100 %
3 1 2 2 1 2	5	0.100 %
3 1 2 3 2 1	5	0.100 %
1 2 1 1 2 2	5	0.100 %
2 2 2 3 2 1	5	0.100 %
1 2 1 2 2 3	5	0.100 %
1 2 2 2 3 2	5	0.100 %
1 1 2 3 2 1	4	0.080 %
1 1 2 3 2 2	4	0.080 %
2 2 3 2 1 1	4	0.080 %
3 2 1 2 2 2	4	0.080 %
1 2 1 3 2 1	4	0.080 %
2 2 1 3 2 1	4	0.080 %
2 2 1 2 3 2	4	0.080 %
3 3 2 1 2 2	4	0.080 %
1 2 2 2 3 3	4	0.080 %

1 3 2 1 2 1	4	0.080 %
1 2 3 2 2 2	3	0.060 %
2 2 3 2 1 3	3	0.060 %
2 1 2 2 3 3	3	0.060 %
1 2 3 1 2 1	3	0.060 %
2 1 1 2 1 2	3	0.060 %
1 2 2 2 2 3	3	0.060 %
1 3 2 2 2 1	3	0.060 %
2 1 2 2 2 3	2	0.040 %
2 2 3 2 3 1	2	0.040 %
2 1 2 2 1 3	2	0.040 %
3 3 2 2 2 1	2	0.040 %
2 2 1 2 2 3	2	0.040 %
1 2 3 2 3 2	2	0.040 %
3 1 2 1 2 3	2	0.040 %
1 2 2 2 3 1	2	0.040 %
2 2 2 2 3 2	2	0.040 %
2 1 2 1 1 1	2	0.040 %
3 2 2 2 2 1	2	0.040 %
2 2 2 1 2 2	2	0.040 %
2 1 2 2 1 1	2	0.040 %
3 1 2 2 1 1	1	0.020 %
3 3 3 3 2 1	1	0.020 %
3 3 2 3 2 2	1	0.020 %
3 3 2 1 2 3	1	0.020 %
3 1 2 2 2 1	1	0.020 %
3 2 1 2 1 1	1	0.020 %
3 2 2 3 2 1	1	0.020 %
3 3 2 2 1 2	1	0.020 %
3 2 2 2 1 1	1	0.020 %
3 2 1 2 3 2	1	0.020 %
1 1 2 1 1 2	1	0.020 %
1 2 1 1 1 1	1	0.020 %
1 2 1 1 1 3	1	0.020 %
1 2 3 1 2 2	1	0.020 %
1 2 3 2 1 1	1	0.020 %
1 3 2 2 1 1	1	0.020 %
1 3 2 3 2 2	1	0.020 %
2 1 1 1 2 1	1	0.020 %
2 1 1 2 3 1	1	0.020 %
2 1 1 3 2 2	1	0.020 %
2 1 2 1 3 2	1	0.020 %
2 1 2 3 2 3	1	0.020 %
2 2 2 2 1 1	1	0.020 %
2 2 2 2 3 1	1	0.020 %
2 2 2 3 2 2	1	0.020 %
2 2 3 2 2 2	1	0.020 %
2 2 3 2 3 3	1	0.020 %
2 2 3 3 2 1	1	0.020 %
2 3 1 3 2 1	1	0.020 %
2 3 2 1 2 3	1	0.020 %
2 3 2 2 2 2	1	0.020 %
2 3 3 2 1 2	1	0.020 %
2 3 3 2 2 1	1	0.020 %
3 1 2 1 1 2	1	0.020 %
– Sum –	5000	100.000 %

Experiment 30 **:** ac-lin15kolstko

pattern	occ.	%
1 1 1 1 1 1	4965	99.300 %
1 1 1 1 1 3	8	0.160 %
1 3 1 1 1 1	8	0.160 %
3 1 1 1 1 1	8	0.160 %
1 1 3 1 1 1	6	0.120 %
1 1 1 3 1 1	3	0.060 %
1 1 1 1 3 1	2	0.040 %
– Sum –	5000	100.000 %

Experiment 31 **:** ac-lin15koVulko

pattern	occ.	%
3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 32 **:** ac-lin15koVulkolstko

pattern	occ.	%
3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 33 **:** ac-lin12ko

pattern	occ.	%
3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 34 **:** ac-lin12kolstko

pattern	occ.	%
3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 35 **:** ac-Vulkolin12ko

pattern	occ.	%
3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 36 **:** ac-lin12koVulkolstko

pattern	occ.	%
3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 37 **:** ac-lin15kolin12ko

pattern	occ.	%
1 1 1 1 1 1	4814	96.280 %
3 1 1 1 1 1	36	0.720 %
1 1 1 1 1 3	34	0.680 %
1 1 1 1 3 1	32	0.640 %
1 1 1 3 1 1	32	0.640 %
1 1 3 1 1 1	27	0.540 %
1 3 1 1 1 1	24	0.480 %
1 1 1 3 1 3	1	0.020 %
– Sum –	5000	100.000 %

Experiment 38 **:** ac-lin12kolin15kolstko

pattern	occ.	%
1 1 1 1 1 1	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 39 **:** ac-lin12kolin15koVulko

pattern	occ.	%
3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 40 **:** ac-lin12kolin15koVulkolstko

pattern	occ.	%
3 3 3 3 3 3	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 41 **:** ac-lin12d

pattern	occ.	%
2 2 2 2 2 2	4751	95.020 %
2 3 2 2 2 2	46	0.920 %
3 2 2 2 2 2	45	0.900 %
2 2 2 2 3 2	44	0.880 %
2 2 3 2 2 2	39	0.780 %
2 2 2 2 2 3	38	0.760 %
2 2 2 3 2 2	28	0.560 %
2 2 2 3 3 2	2	0.040 %
2 2 2 2 3 3	1	0.020 %
2 2 2 3 2 3	1	0.020 %
2 3 2 2 2 3	1	0.020 %
2 3 2 3 2 2	1	0.020 %
2 3 3 2 2 2	1	0.020 %
3 2 2 2 3 2	1	0.020 %
3 2 2 3 2 2	1	0.020 %
– Sum –	5000	100.000 %

Experiment 42 **:** ac-lin12dlstko

pattern	occ.	%
2 2 2 2 2 2	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 43 **:** ac-Vulkolin12d

PATTERN	OCC.	%
2 2 2 2 2 2	5000	100.000 %
– SUM –	5000	100.000 %

Experiment 44 **:** ac-lin12dVulkolstko

PATTERN	OCC.	%
2 2 2 2 2 2	4999	99.980 %
2 2 2 2 2 3	1	0.020 %
– SUM –	5000	100.000 %

Experiment 45 **:** ac-lin15kolin12d

PATTERN	OCC.	%
2 2 2 2 2 2	4754	95.080 %
2 2 2 2 3 2	46	0.920 %
2 2 3 2 2 2	37	0.740 %
2 2 2 3 2 2	36	0.720 %
2 2 2 2 2 3	35	0.700 %
2 3 2 2 2 2	34	0.680 %
3 2 2 2 2 2	33	0.660 %
2 2 2 1 2 2	5	0.100 %
2 2 2 2 2 1	5	0.100 %
2 1 2 2 2 2	4	0.080 %
2 2 2 2 1 2	3	0.060 %
2 2 2 2 3 3	1	0.020 %
2 2 2 3 2 3	1	0.020 %
2 2 2 3 3 2	1	0.020 %
2 2 2 2 1 3	1	0.020 %
2 2 3 2 2 3	1	0.020 %
2 3 2 2 3 2	1	0.020 %
3 2 2 2 2 3	1	0.020 %
3 2 3 2 2 2	1	0.020 %
– SUM –	5000	100.000 %

Experiment 46 **:** ac-lin12dlin15kolstko

PATTERN	OCC.	%
1 1 1 1 1 1	5000	100.000 %
– SUM –	5000	100.000 %

Experiment 47 **:** ac-lin12dlin15koVulko

PATTERN	OCC.	%
2 2 2 2 2 2	4999	99.980 %
2 2 2 2 2 3	1	0.020 %
– SUM –	5000	100.000 %

Experiment 48 **:** ac-lin12dlin15koVulkolstko

PATTERN	OCC.	%
2 2 2 2 2 2	5000	100.000 %
– SUM –	5000	100.000 %

Experiment 49 **:** let60

PATTERN	OCC.	%
3 3 3 3 3 3	5000	100.000 %
– SUM –	5000	100.000 %

Experiment 50 **:** lin3

PATTERN	OCC.	%
3 3 3 3 3 3	5000	100.000 %
– SUM –	5000	100.000 %

Experiment 51 **:** lin3d

PATTERN	OCC.	%
3 2 1 1 1 2	5000	100.000 %
– SUM –	5000	100.000 %

Experiment 52 **:** mir61ce

PATTERN	OCC.	%
2 2 2 2 2 2	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 53 : ac-mir61ce

PATTERN	OCC.	%
2 2 2 2 2 2	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 54 : mir61ceVulko

PATTERN	OCC.	%
2 2 2 2 2 2	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 55 : mir61celstko

PATTERN	OCC.	%
2 2 2 2 2 2	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 56 : mir61kolstko

PATTERN	OCC.	%
3 2 1 1 1 2	1594	31.880 %
3 3 2 1 1 2	1399	27.980 %
3 3 2 1 2 3	1000	20.000 %
3 2 1 1 2 3	998	19.960 %
3 2 3 1 1 2	4	0.080 %
3 2 1 1 3 2	2	0.040 %
3 2 3 1 2 3	2	0.040 %
3 3 2 1 3 2	1	0.020 %
– Sum –	5000	100.000 %

Experiment 57 : mir61kovav1ko

PATTERN	OCC.	%
2 2 2 2 2 2	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 58 : dpy23ko

PATTERN	OCC.	%
3 3 1 1 1 3	4939	98.780 %
3 3 2 1 1 3	31	0.620 %
3 3 1 1 2 3	30	0.600 %
– Sum –	5000	100.000 %

Experiment 59 : lstOnlyko

PATTERN	OCC.	%
3 3 2 1 2 3	4600	92.000 %
3 2 1 1 2 3	377	7.540 %
3 3 1 1 2 3	23	0.460 %
– Sum –	5000	100.000 %

Experiment 60 : mir61cedpy23ko

PATTERN	OCC.	%
2 2 1 1 1 2	4935	98.700 %
2 2 2 1 1 2	34	0.680 %
2 2 1 1 2 2	31	0.620 %
– Sum –	5000	100.000 %

Experiment 61 : mir61celstOnlyko

PATTERN	OCC.	%
2 2 2 2 2 2	5000	100.000 %
– Sum –	5000	100.000 %

Experiment 62 : mir61kodpy23ko

PATTERN	OCC.	%
3 3 2 1 2 3	4711	94.220 %
3 3 2 1 1 3	142	2.840 %
3 3 1 1 2 3	140	2.800 %
3 3 2 1 3 3	3	0.060 %
3 3 3 1 2 3	3	0.060 %
3 3 1 1 1 3	1	0.020 %
– SUM –	5000	100.000 %

Experiment 63 **:** mir61kolstOnlyko

PATTERN	OCC.	%
3 2 1 1 1 2	1594	31.880 %
3 3 2 1 1 2	1399	27.980 %
3 3 2 1 2 3	1000	20.000 %
3 2 1 1 2 3	998	19.960 %
3 2 3 1 1 2	4	0.080 %
3 2 1 1 3 2	2	0.040 %
3 2 3 1 2 3	2	0.040 %
3 3 2 1 3 2	1	0.020 %
– SUM –	5000	100.000 %

Experiment 64 **:** unkko

PATTERN	OCC.	%
3 3 1 1 1 3	4928	98.560 %
3 3 1 1 3 3	39	0.780 %
3 3 3 1 1 3	33	0.660 %
– SUM –	5000	100.000 %

VPC Demo

VPC demo is a short motion picture presenting the execution of fate determination in the process of *C. elegans* vulval development. The model is based on Petri nets where many transitions can execute in parallel in a single step.

The demo presents a zoomed-out network. It contains six identical Vulval Precursor Cells, VPCs (aligned at the bottom), the Anchor Cell (above the VPCs, on the right) and hypothelium (above the VPCs, on the left). Cells are linked only to the adjacent VPCs as well as to the Anchor Cell and hypothelium.

Small circles, places in Petri Net terminology, represent proteins or genes. Squares or transitions represent state changes, such as reactions, protein state changes, signalling. Blue color denotes presence of a protein/gene. Red color represents reaction taking place.

The clip executes wild-type cells. Observe how Anchor Cell sends LIN-3 signals to the cells, how the P6.p initiates lateral signals and how the cells adopts a specific fate. Viewing takes approximately 1.5 minute. The file size is 9.7MB.

Table 1: Cell fate descriptions based on MPK-1* and LIN-12* profiles described in the paper. μ(MPK-1*) is the marking of the place MPK-1* and μ(LIN-12*) is LIN-12* marking. We interpret markings > 3 as *high* concentration levels and marking ≤ 3 as *low*. Fate Function f is the piecewise function used to predict cell fates.

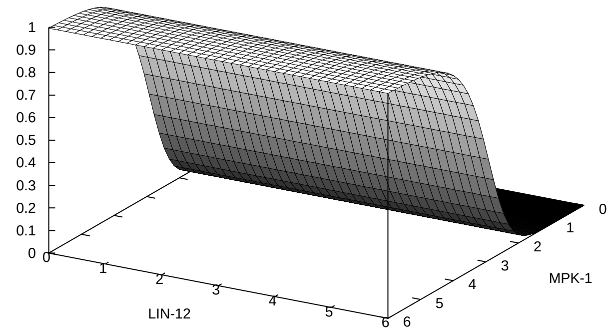
MPK-1*	LIN-12*	Cell Fate	Fate Function
high	high	1°	$f = \begin{cases} 1^\circ & \text{if } \mu(\text{MPK-1*}) > 3, \\ 2^\circ & \text{if } \mu(\text{MPK-1*}) \leq 3 \text{ and} \\ & \mu(\text{LIN-12*}) > 3, \\ 3^\circ & \text{otherwise.} \end{cases}$
high	low	1°	
low	high	2°	
low	low	3°	

Analytic form of the sigmoidal cell fate scoring function for 1° fate (1), 2° fate (2), and 3° fate (3). α is the maximum concentration level (i.e. $\alpha = 6$) and β is the parameter that control the steepness of the functions (we used an arbitrary value of 8). $mpk1$ and $lin12$ are the concentration levels of the two corresponding proteins. See the paper for further explanation.

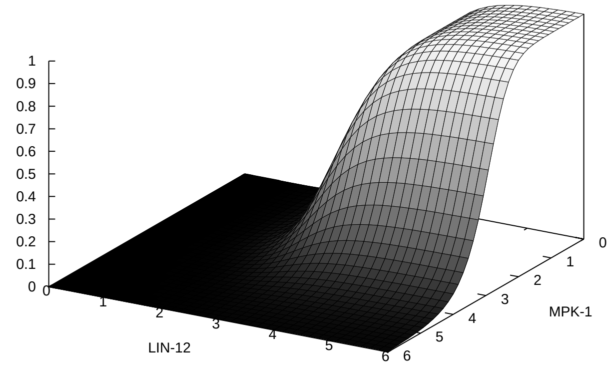
$$f_1(mpk1, lin12) = \frac{1}{1 + \left(\frac{\frac{\alpha}{2}}{mpk1}\right)^{\beta}} \tag{1}$$

$$f_2(mpk1, lin12) = \frac{1}{1 + \left(\frac{\frac{\alpha}{2}}{lin12}\right)^{\beta}} \cdot \frac{1}{1 + \left(\frac{mpk1}{\frac{\alpha}{2}}\right)^{\beta}} \tag{2}$$

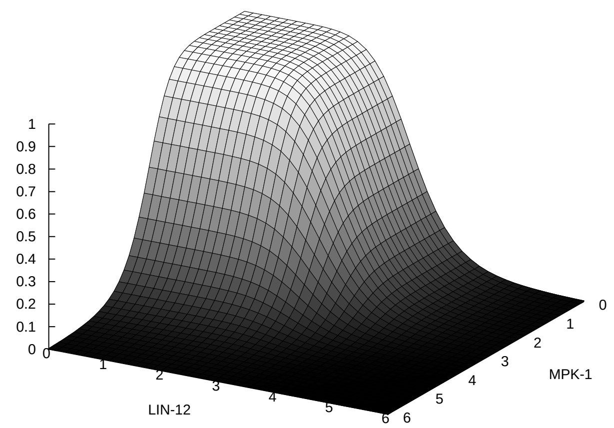
$$f_3(mpk1, lin12) = \frac{1}{1 + \left(\frac{mpk1}{\frac{\alpha}{2}}\right)^{\beta}} \cdot \frac{1}{1 + \left(\frac{lin12}{\frac{\alpha}{2}}\right)^{\beta}} \tag{3}$$



(a)



(b)



(c)

Figure 1: S-shaped cell fate score function for 1° fate (a), 2° fate (b), and 3° fate (c), as functions of the level of LIN-12* and MPK-1*.

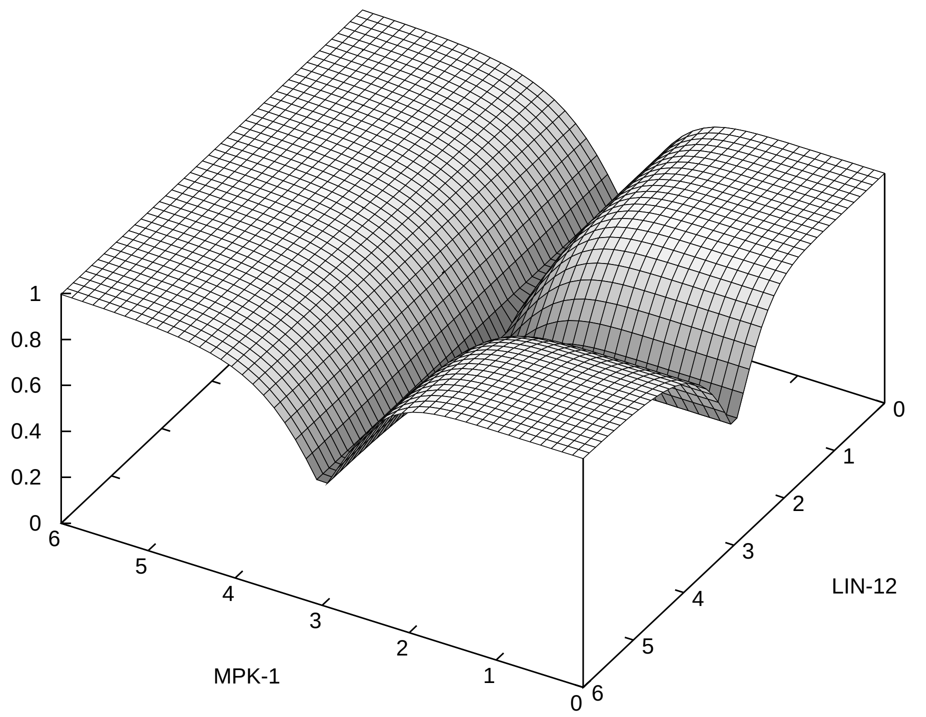
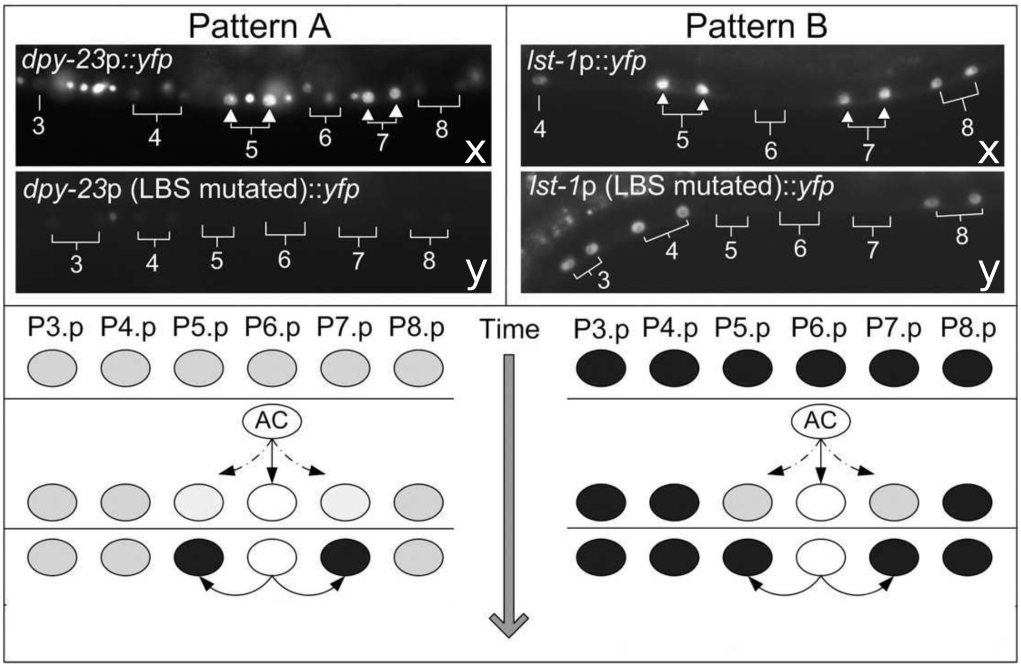
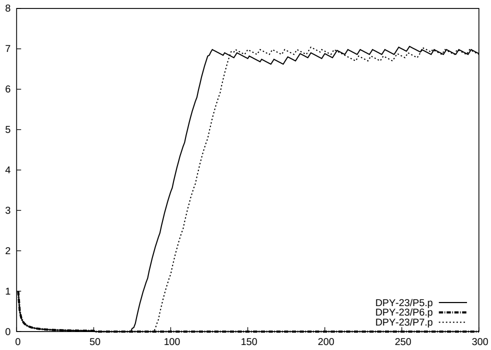


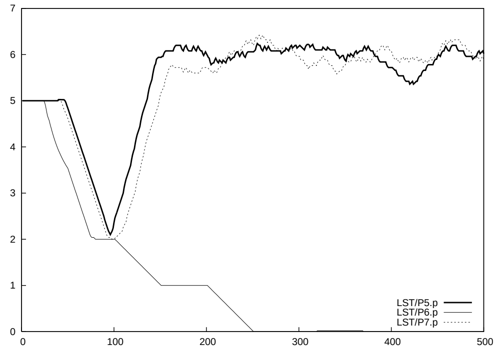
Figure 2: Landscape produced intersecting the three scoring functions. Three dimensional view.



(a)



(b)



(c)

Figure 3: Comparison between photomicrographs and simulation results. (a) Representatives of lst genes belonging to patterns A (dpy-23, lst-3) and B (lst-1, lst-2, lst-4) adapted from Yoo *et al.* (2004), Science Magazine © 2004, AAAS. Cartoons summarise the observed expression level over time. (b) Time series plot generated by our model, showing the expression of the two different patterns DPY-23 (*left*) and LST (*right*).

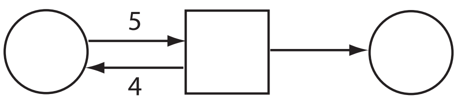


Figure 4: Initially, before calibration, we assigned high requirements and low level production to all transitions, i.e. respectively arc weights five for preconditions and one for postconditions (no explicit weight depicted means conventionally that the weight is 1). Note that four are pushed back because not consumed by the transition.

References

Yoo, A. S., Bais, C., and Greenwald, I. (2004). Crosstalk between the EGFR and LIN-12/Notch pathways in *C. elegans* vulval development. *Science*, **303**, 663–666.