

## PAM 50

	H	E	A	G	A	W
P	-2	-1	-1	-2	-1	-4
A	-2	-1	<b>5</b>	0	<b>5</b>	-3
W	-3	-3	-3	-3	-3	<b>15</b>
H	<b>10</b>	0	-2	-2	-2	-3
E	0	<b>6</b>	-1	-3	-1	-3

# OGA example

	H	E	A	G	A	W	G	H	E	E	
	0 ←	-8 ←	-16 ←	-24 ←	-32 ←	-40 ←	-48 ←	-56 ←	-64 ←	-72 ←	-80
P	-8 ↖	-2 ↖	-9 ↖	-17 ←	-25 ↖	-33 ←	-42 ←	-49 ←	-57 ↖	-65 ↖	-73
A	-16 ↖	-10 ↖	-3 ↖	-4 ←	-12 ↖	-20 ←	-28 ←	-36 ←	-44 ←	-52 ←	-60
W	-24 ↖	-18 ↖	-11 ↖	-6 ↖	-7 ↖	-15 ↖	-5 ←	-13 ←	-21 ←	-29 ←	-37
H	-32 ↖	-14 ↖	-18 ↖	-13 ↖	-8 ↖	-9 ↖	-13 ↖	-7 ↖	-3 ←	-11 ←	-19
E	-40 ↖	-22 ↖	-8 ←	-16 ↖	-16 ↖	-9 ↖	-12 ↖	-15 ↖	-7 ↖	3 ↖	-5
A	-48 ↖	-30 ↖	-16 ↖	-3 ←	-11 ↖	-11 ↖	-12 ↖	-12 ↖	-15 ↖	-5 ↖	2
E	-56 ↖	-38 ↖	-24 ↖	-11 ↖	-6 ↖	-12 ↖	-14 ↖	-15 ↖	-12 ↖	-9 ↖	1

HEAGAWGHE-E

--P-AW-HEAE

## PAM 50

	H	E	A	G	A	W
P	-2	-1	-1	-2	-1	-4
A	-2	-1	<b>5</b>	0	<b>5</b>	-3
W	-3	-3	-3	-3	-3	<b>15</b>
H	<b>10</b>	0	-2	-2	-2	-3
E	0	<b>6</b>	-1	-3	-1	-3

# OGA example

		H	E	A	G	A	W	G	H	E	E
	0	0	0	0	0	0	0	0	0	0	0
P	0	0	0	0	0	0	0	0	0	0	0
A	0	0	0	5	0	5	0	0	0	0	0
W	0	0	0	0	2	0	<b>20</b>	<b>12</b>	4	0	0
H	0	<b>10</b>	2	0	0	0	12	18	<b>22</b>	14	6
E	0	2	<b>16</b>	8	0	0	4	10	18	<b>28</b>	20
A	0	0	8	<b>21</b>	13	5	0	4	10	20	27
E	0	0	6	13	18	12	4	0	4	16	26

AWGHE

AW-HE

# Waterman-Eggert (I)

	A	G	T	C	C	G	A	G	G	G	C	T	A	C	T	C	T	A	C	T	G	A	A	C
C	0	0	0	10	10	0	0	0	0	0	10	0	0	10	0	10	0	0	10	0	0	0	0	10
C	0	0	0	10	20	1	0	0	0	0	10	1	0	10	1	10	1	0	10	1	0	0	0	10
A	10	0	0	0	1	11	11	0	0	0	0	1	11	0	1	0	1	11	0	1	0	10	10	0
A	10	1	0	0	0	0	21	2	0	0	0	0	11	2	0	0	0	11	2	0	0	10	20	1
T	0	1	11	0	0	0	1	12	0	0	0	10	0	2	12	0	10	0	2	12	0	0	1	11
C	0	0	0	21	10	0	0	0	3	0	10	0	1	10	0	22	2	1	10	0	3	0	0	11
T	0	0	10	1	12	1	0	0	0	0	0	20	0	0	20	2	32	12	0	20	0	0	0	0
A	10	0	0	1	0	3	11	0	0	0	0	0	30	10	0	11	12	42	22	2	11	10	10	0
C	0	1	0	10	11	0	0	2	0	0	10	0	10	40	20	10	2	22	52	32	12	2	1	20
T	0	0	11	0	1	2	0	0	0	0	0	20	0	20	50	30	20	2	32	62	42	22	2	0
A	10	0	0	2	0	0	12	0	0	0	0	0	30	10	30	41	21	30	12	42	53	52	32	12
C	0	1	0	10	12	0	0	3	0	0	10	0	10	40	20	40	32	12	40	22	33	44	43	42
T	0	0	11	0	1	3	0	0	0	0	0	20	0	20	50	30	50	30	20	50	30	24	35	34
G	0	10	0	2	0	11	0	10	10	10	0	0	11	0	30	41	30	41	21	30	60	40	20	26
C	0	0	1	10	12	0	2	0	1	1	20	0	0	21	10	40	32	21	51	31	40	51	31	30
T	0	0	10	0	1	3	0	0	0	0	0	30	10	1	31	20	50	30	31	61	41	31	42	22
T	0	0	10	1	0	0	0	0	0	0	0	10	21	1	11	22	30	41	21	41	52	32	22	33
G	0	10	0	1	0	10	0	10	10	10	0	0	1	12	0	2	13	21	32	21	51	43	23	13
C	0	0	1	10	11	0	1	0	1	1	20	0	0	11	3	10	0	4	31	23	31	42	34	33
A	10	0	0	0	1	2	10	0	0	0	0	11	10	0	2	0	1	10	11	22	14	41	52	32
G	0	20	0	0	0	11	0	20	10	10	0	0	2	1	0	0	0	0	1	2	32	21	32	43
T	0	0	30	10	0	0	2	0	11	1	1	10	0	0	11	0	10	0	0	11	12	23	12	23
A	10	0	10	21	1	0	10	0	0	2	0	0	20	0	0	2	0	20	0	0	2	22	33	13
C	0	1	0	20	31	11	0	1	0	0	12	0	0	30	10	10	0	0	30	10	0	2	13	43

# Waterman-Eggert (II)

	A	G	T	C	C	G	A	G	G	G	C	T	A	C	T	C	T	A	C	T	G	A	A	C
C	0	0	0	10	10	0	0	0	0	0	0*	0*	0	10	0	10	0	0	10	0	0	0	0	10
C	0	0	0	10	20	1	0	0	0	0	10*	0*	0*	10	1	10	1	0	10	1	0	0	0	10
A	10	0	0	0	1	11	11	0	0	0	0	1*	0*	0*	1	0	1	11	0	1	0	10	10	0
A	10	1	0	0	0	0	21	2	0	0	0	0	11*	0*	0*	0	0	11	2	0	0	10	20	1
T	0	1	11	0	0	0	1	12	0	0	0	10	0	2*	0*	0*	10	0	2	12	0	0	1	11
C	0	0	0	21	10	0	0	0	3	0	10	0	1	10	0*	0*	0*	1*10	0	3	0	0	0	11
T	0	0	10	1	12	1	0	0	0	0	0	20	0	0	20	0*	0*	0*	0*20	0	0	0	0	0
A	10	0	0	1	0	3	11	0	0	0	0	0	30	10	0	11*	0*	0*	0*	0*11*10	10	0	0	0
C	0	1	0	10	11	0	0	2	0	0	10	0	10	40	20	10	2*	0*	0*	0*	0*	2*	1	20
T	0	0	11	0	1	2	0	0	0	0	0	20	0	20	50	30	20	0*	0*	0*	0*	0*	0*	0*
A	10	0	0	2	0	0	12	0	0	0	0	0	30	10	30	41	21	30*10*	0*	0*	10*10*	0*	0*	0*
C	0	1	0	10	12	0	0	3	0	0	10	0	10	40	20	40	32	12	40*20*	0*	0*	1*20*	0*	0*
T	0	0	11	0	1	3	0	0	0	0	0	20	0	20	50	30	50	30	20	50*30*	10*	0*	0*	0*
G	0	10	0	2	0	11	0	10	10	10	0	0	11	0	30	41	30	41	21	30	60	40*20*	0*	0*
C	0	0	1	10	12	0	2	0	1	1	20	0	0	21	10	40	32	21	51	31	40	51	31	30*
T	0	0	10	0	1	3	0	0	0	0	0	30	10	1	31	20	50	30	31	61	41	31	42	22
T	0	0	10	1	0	0	0	0	0	0	0	10	21	1	11	22	30	41	21	41	52	32	22	33
G	0	10	0	1	0	10	0	10	10	10	0	0	1	12	0	2	13	21	32	21	51	43	23	13
C	0	0	1	10	11	0	1	0	1	1	20	0	0	11	3	10	0	4	31	23	31	42	34	33
A	10	0	0	0	1	2	10	0	0	0	0	11	10	0	2	0	1	10	11	22	14	41	52	32
G	0	20	0	0	0	11	0	20	10	10	0	0	2	1	0	0	0	0	1	2	32	21	32	43
T	0	0	30	10	0	0	2	0	11	1	1	10	0	0	11	0	10	0	0	11	12	23	12	23
A	10	0	10	21	1	0	10	0	0	2	0	0	20	0	0	2	0	20	0	0	2	22	33	13
C	0	1	0	20	31	11	0	1	0	0	12	0	0	30	10	10	0	0	30	10	0	2	13	43

# minimal envelope for shifted gap function

