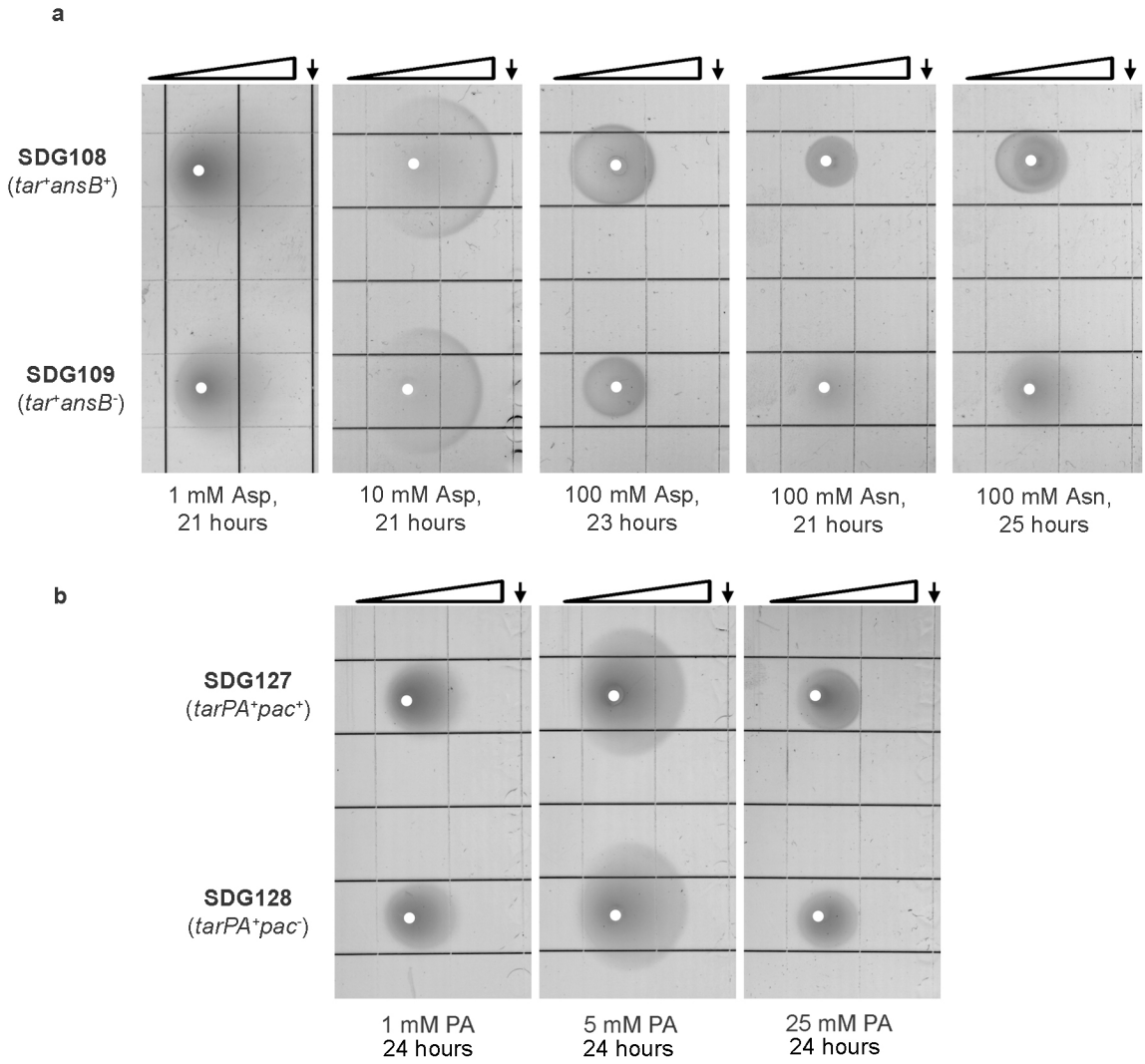
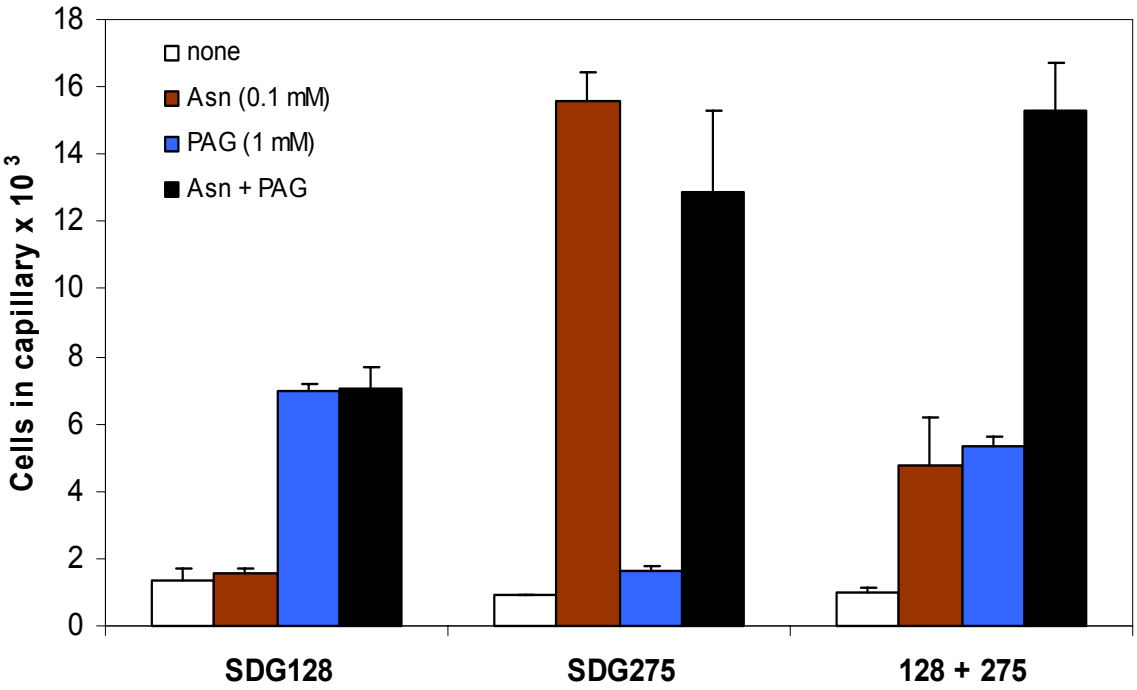
Figure S1



Supplementary Figure S1: Chemotaxis on soft agar gradient plates.
Panels show images of bacteria 19-25 hours after inoculation of soft agar plates containing a gradient formed by spotting attractant onto the line indicated by the arrow. (a) SDG108 and SDG109 show similar chemotaxis on the control substrate, aspartate. The SDG108 strain grows slightly faster than SDG109, but the patterns formed are similar. SDG108 shows a pattern indicative of chemotaxis up the gradient on 100 mM asparagine at 21 hours; at 25 hours the strain shows a distinctive 2-ring pattern. This pattern is reproducible, but its cause is unclear. (b) SDG127 and SDG128 produce similar patterns on the control substrate PAG. Note that the patterns indicative of chemotaxis are not due simply to increased growth rates at higher attractant concentrations, as the strain SDG128 (which is *ansB*$^+$ but lacks *tar*) does not show this pattern on asparagine (Figure 3b upper left) and SDG275 (which is *pac*$^+$ but lacks *tarPA4*) does not show this pattern on PAG (Figure 3b lower middle). Images shown are representative of experiments that were performed at least three times. The white dots indicate the points where culture was applied to the plates. The grid squares are 13 mm×13 mm. Images are shown as negatives; the contrast has been heightened slightly and uniformly to improve visibility.

Figure S2



Supplementary Figure S2: Capillary assays.
Responses of the strains SDG128, SDG275, and the designed microbial consortium composed of both strains SDG128 and SDG275, to attractants. The total number of cells in the pools that the capillaries were inserted into was the same in all experiments, so in the mixture of SDG128 and SDG275 there were half as many cells of each strain as when the strains were tested alone. Results are the averages of at least two capillaries. Error bars indicate standard errors.

Table S1

Strain mixture	Attractant	Initial ratio	Enrichment (ratio in leading edge)/ (initial ratio)
SDG108:SDG109 (*asnB*$^+$ *tar*$^+$: *asnB*$^-$ *tar*$^+$)	Asn	0.13	0.92 ± 0.10
	Asn	0.28	1.4 ± 0.13
	Asn	0.29	1.7 ± 0.34
	Asn	0.33	2.1 ± 0.05
	Asn	0.79	2.2 ± 0.01
SDG127:SDG128 (*pac*$^+$ *tarPA*$^+$: *pac*$^-$ *tarPA*$^+$)	PAG	0.09	5.3 ± 0.06
	PAG	0.09	4.7 ± 0.39
	PAG	0.10	2.4 ± 0.20
	PAG	0.13	5.2 ± 0.43
	PAG	0.13	3.3 ± 0.09
	PAG	0.23	4.0 ± 0.06
	PAG	0.23	3.2 ± 0.29
	PAG	0.40	6.7 ± 1.3
	PAG	0.43	1.6 ± 0.12
SDG108:SDG128 (*asnB*$^+$ *tar*$^+$: *pac*$^-$ *tarPA*$^+$)	Asn	0.09	> 2000
SDG127:SDG109 (*pac*$^+$ *tarPA*$^+$: *asnB*$^-$ *tar*$^+$)	PAG	0.09	260 ± 97

Supplementary Table S1: Chemotaxis competition assay.
The table shows enrichment for enzyme$^+$ receptor$^+$ strains SDG108 and SDG127 in competition with the respective enzyme$^-$ receptor$^+$ strains SDG109 and SDG128 on soft agar gradient plates. Negative controls are also shown in which the enzyme$^+$ receptor$^+$ strains compete with strains that lack the appropriate chemoreceptor. (Note that strains lacking **all** chemoreceptors have poor motility on soft agar, so the appropriate negative control is a strain that has a mismatched chemoreceptor). For each mixture, the initial ratio of the two strains was determined by spreading a portion of the mixture on LB agar plates, and counting colony forming units (cfus) for each strain (distinguished by the GFP that is expressed by SDG108 and SDG127). After spotting the mixtures on soft agar plates containing a preformed gradient of 10 mM Asn for SDG108-containing mixtures or 10 mM PAG for SDG127-containing mixtures, and allowing ~24 hours of growth at 30°C, the leading edge of cells that moved the farthest up the gradient was harvested and the ratio of strains in this mixture was determined. Enrichment was calculated by dividing the ratio of strains in the leading edge by the initial ratio. Each data point represents the average of two competitions, with the range ((x1-x2)/2) indicated.
The negative controls showed very high levels of enrichment. The selections on asparagine yielded 100% SDG108 when cfu were determined. Since the determination of enrichment in this case is limited by the number of colonies that were counted, we have represented it as an inequality. The PAG selection contained 95-98% strain SDG127 in the leading edge, for an enrichment of 260. The experiments in which enzyme$^+$ receptor$^+$ strains competed with enzyme$^-$ receptor$^+$ gave much smaller enrichments, ranging for 1 to 6.7, thus demonstrating that enzyme$^-$ receptor$^+$ strains can follow enzyme$^+$ receptor$^+$ strains up a gradient provided they have the same receptor.