

Supplementary Materials for
Modular reconfiguration of DNA origami assemblies using tile displacement

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The PDF file includes:

Figs. S1 to S19
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Other Supplementary Material for this manuscript includes the following:

MDAR Reproducibility Checklist
Mathematica code

Supplementary Figures

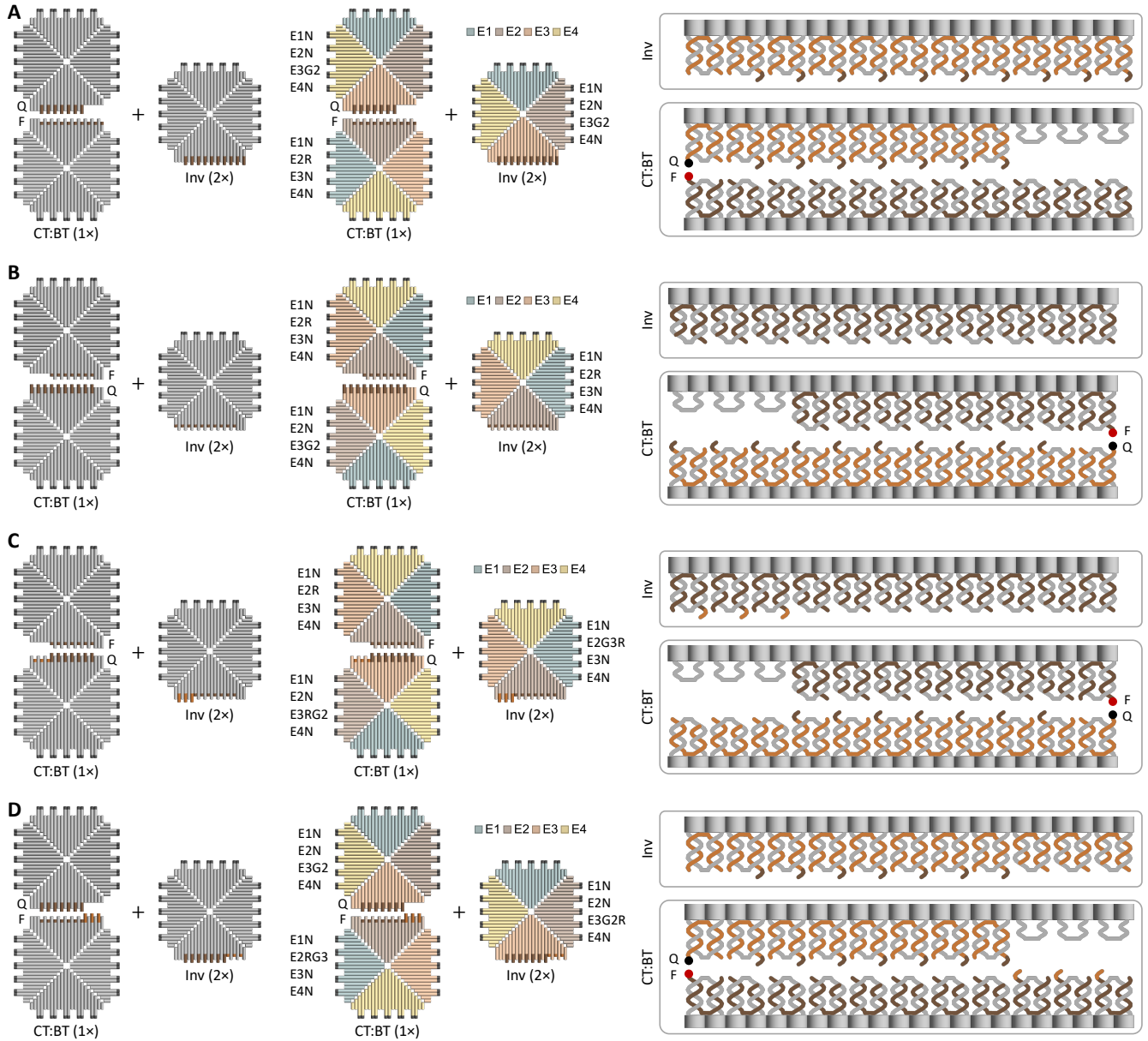


Fig. S1. Designs with four combinations of giving or receiving toehold and branch migration domains. (A) Giving toehold and giving branch migration domain (G-G). **(B)** Receiving toehold and receiving branch migration domain (R-R). **(C)** Giving toehold and receiving branch migration domain (G-R). **(D)** Receiving toehold and giving branch migration domain (R-G). $ExGy$ indicates edge x giving to edge y , ExR indicates receiving edge x , ExN indicates inert edge x , where $x, y \in \{1, 2, 3, 4\}$.

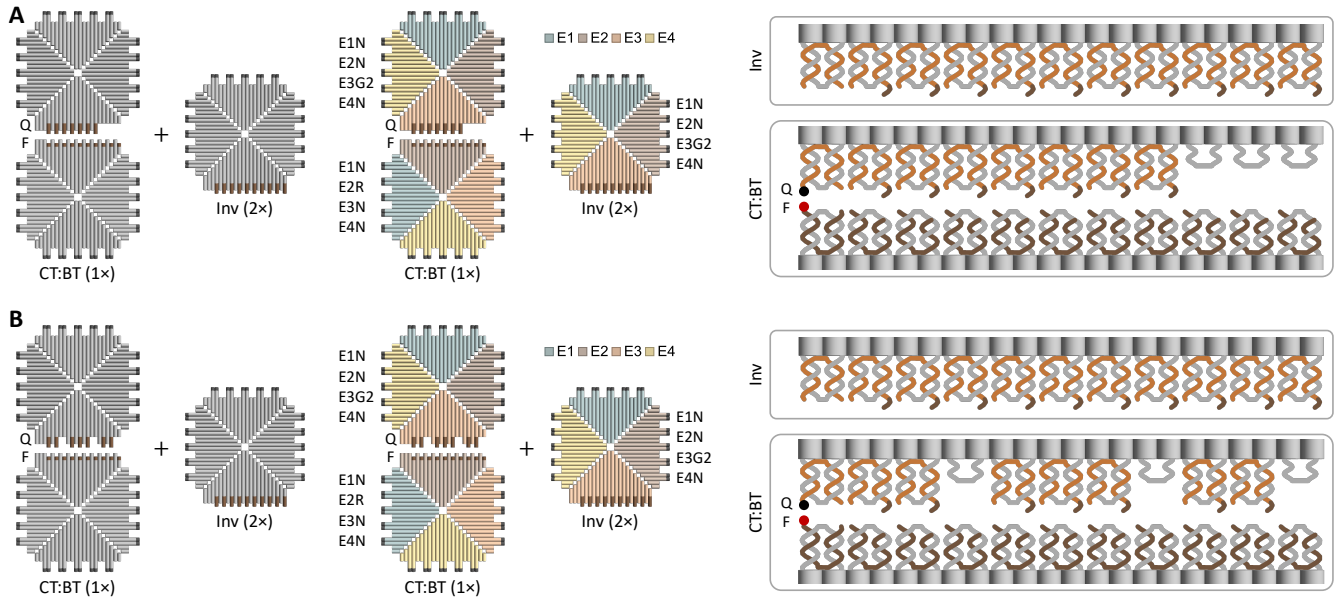


Fig. S2. Designs with continuous and discontinuous toe-holds. (A) Continuous toe-hold (same as the design shown in fig. S1A). (B) Discontinuous toe-hold. $ExGy$ indicates edge x giving to edge y , ExR indicates receiving edge x , ExN indicates inert edge x , where $x, y \in \{1, 2, 3, 4\}$.

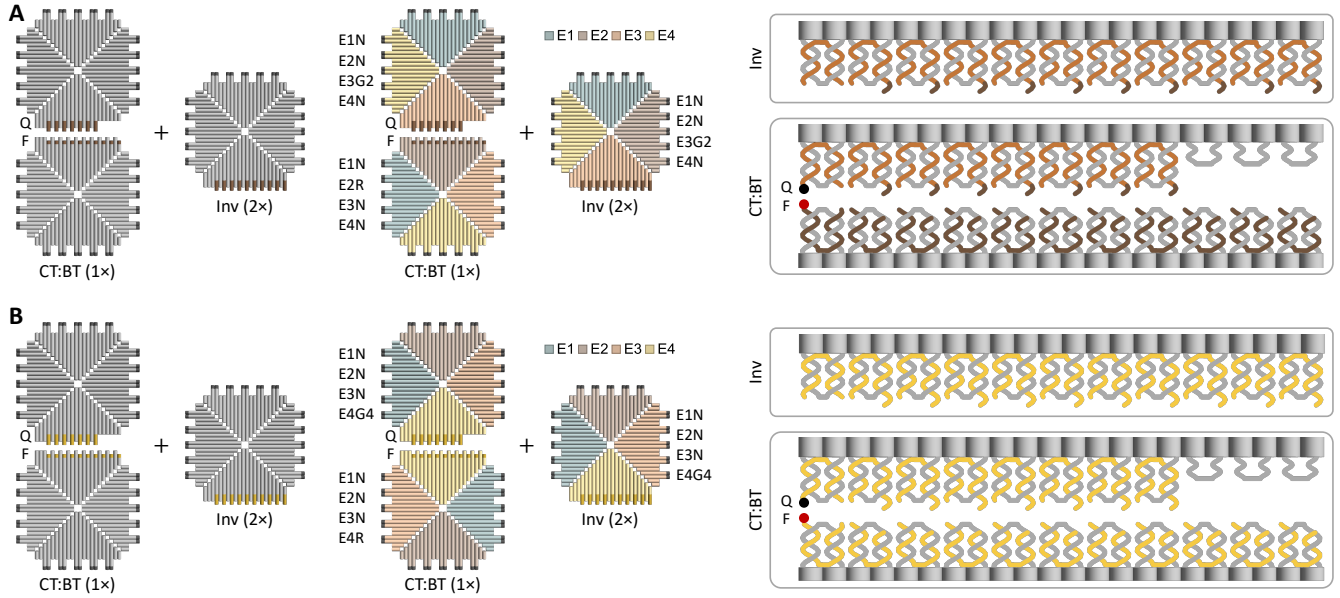


Fig. S3. Designs with distinct edge identities. (A) Edge 3 giving to edge 2 (same as the design shown in fig. S1A). (B) Edge 4 giving to edge 4. $ExGy$ indicates edge x giving to edge y , ExR indicates receiving edge x , ExN indicates inert edge x , where $x, y \in \{1, 2, 3, 4\}$.

A

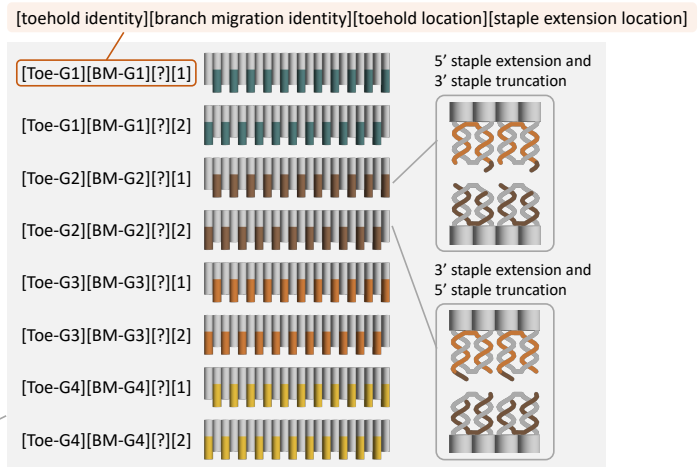
N_t : Number of toehold identities
 N_b : Number of branch migration identities for a given toehold
 N_p : Number of toehold locations
 N_e : Number of staple extension locations

Number of distinct reactions: $N = N_t \times N_b \times N_p \times N_e$

	N_t	N_b	N_p	N_e	N
G-G	4	1	1	2	8
R-R	4	1	1	2	8
G-R	4	4	2	2	64
R-G	4	4	2	2	64
Total					144

Example 1: G-G, $N_t = 4$, $N_b = 1$, $N_p = 1$, and $N_e = 2$

Example 2: R-G, $N_b = 4$ and $N_p = 2$ (continuous toehold)



B

	N_t	N_b	N_p	N_e	N
G-G	4	1	1	2	8
R-R	4	1	1	2	8
G-R	4	4	17	2	544
R-G	4	4	17	2	544
Total					1104

Example 3: R-G, $N_p = 17$ (discontinuous toehold)



C

	N_t	N_b	N_p	N_e	N
G-G	4	1	1	2	8
R-R	4	1	1	2	8
G-R	4	3	17	2	408
R-G	4	3	17	2	408
Total					832



Fig. S4. Numbers of distinct tile displacement reactions (A) with continuous toeholds, (B) with discontinuous toeholds, and (C) with discontinuous toeholds and without self-occluding edges. The number of distinct reactions are determined by the number of unique invader tiles, whose edges are illustrated here. Example 1 shows all possible G-G invaders, in which [?] indicates that all possible toehold locations result in the same invader, because the difference only appears on the cover tile. Example 2 shows all possible branch migration identities and toehold locations for a given toehold identity and staple extension location in R-G invaders. Example 3 shows 17 discontinuous toehold locations for a given toehold and branch migration identity and staple extension location in R-G invaders. The number of discontinuous toeholds is calculated based on a coding-theoretic function (Theorem 4 of Brouwer *et al.*): given n items taken three at a time, the maximum number of combinations such that no two combinations share more than one item in common. Here $n = 11$ edge staples, three is the number of staples in a toehold, and we require no more than one common staple between any toeholds to ensure specificity.

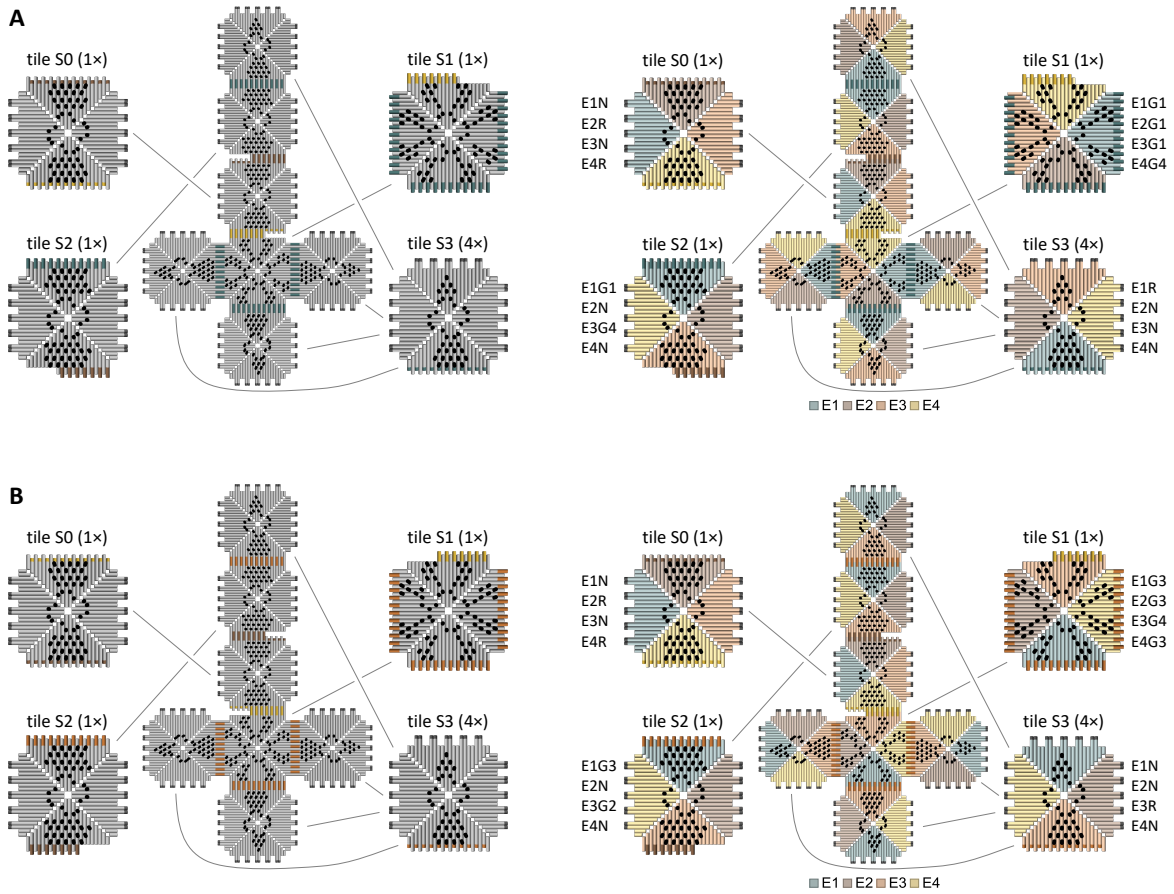


Fig. S5. Designs of the sword assembly. (A) Design1. (B) Design2. $ExGy$ indicates edge x giving to edge y , ExR indicates receiving edge x , ExN indicates inert edge x , where $x, y \in \{1, 2, 3, 4\}$.

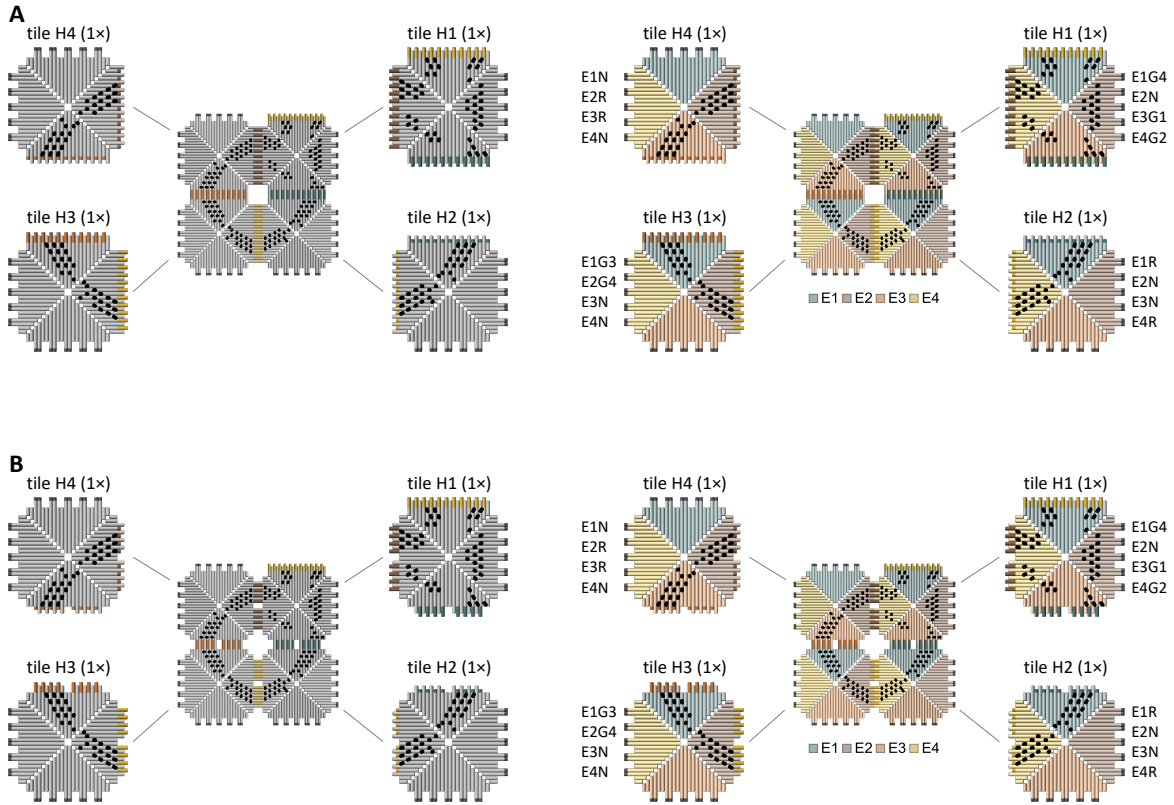


Fig. S6. Designs of the snake head invader. (A) Design1. (B) Design2. $ExGy$ indicates edge x giving to edge y , ExR indicates receiving edge x , ExN indicates inert edge x , where $x, y \in \{1, 2, 3, 4\}$.

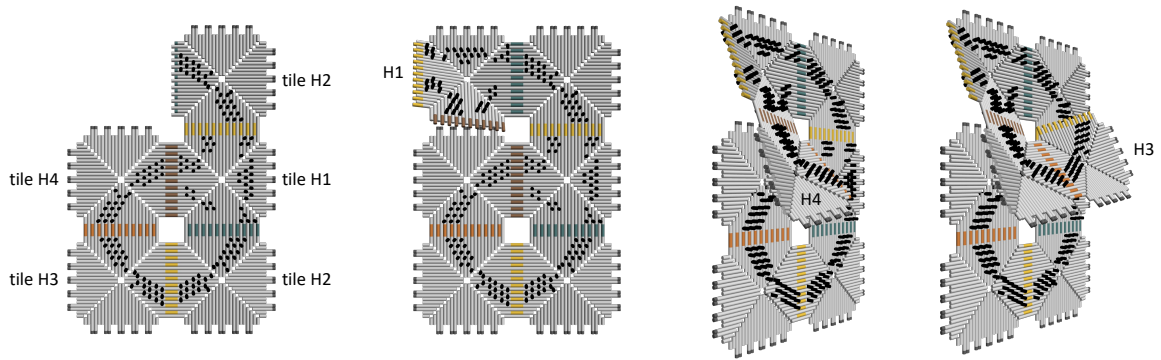


Fig. S7. Undesired binding in the snake head invader. Undesired binding occurs between the giving edge $E1G4$ on tile $H1$ and the receiving edge $E4R$ on tile $H2$, which could result in further growth of spurious structures with more tiles.

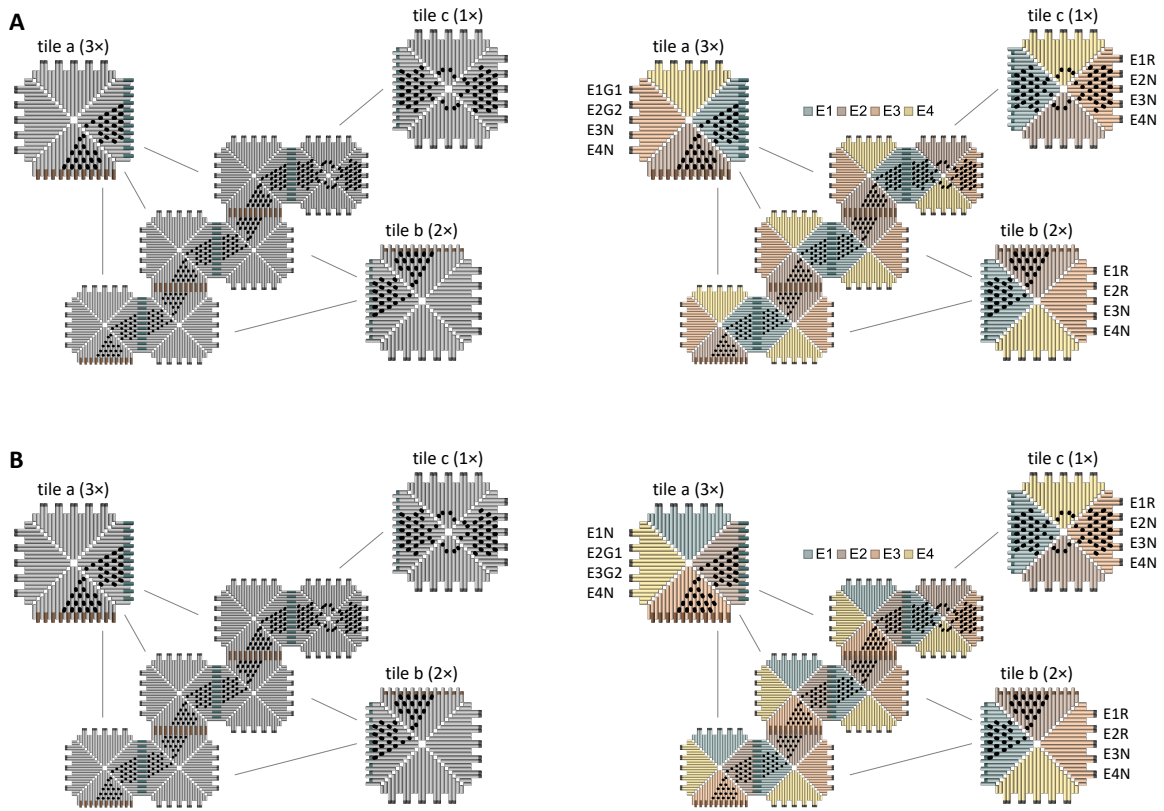


Fig. S8. Designs of the snake tail invader. (A) Design1. (B) Design2. $ExGy$ indicates edge x giving to edge y , ExR indicates receiving edge x , ExN indicates inert edge x , where $x, y \in \{1, 2, 3, 4\}$.

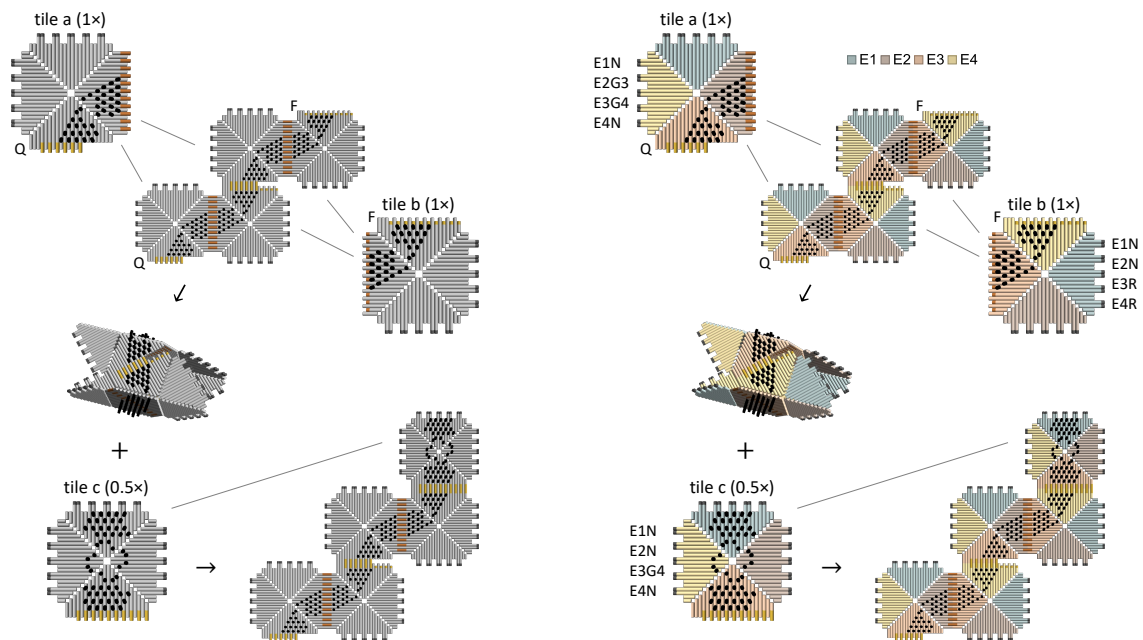


Fig. S9. Design of the tile displacement system that reconfigures 3D barrels to 2D polymers. E_xG_y indicates edge x giving to edge y , E_xR indicates receiving edge x , E_xN indicates inert edge x , where $x, y \in \{1, 2, 3, 4\}$.

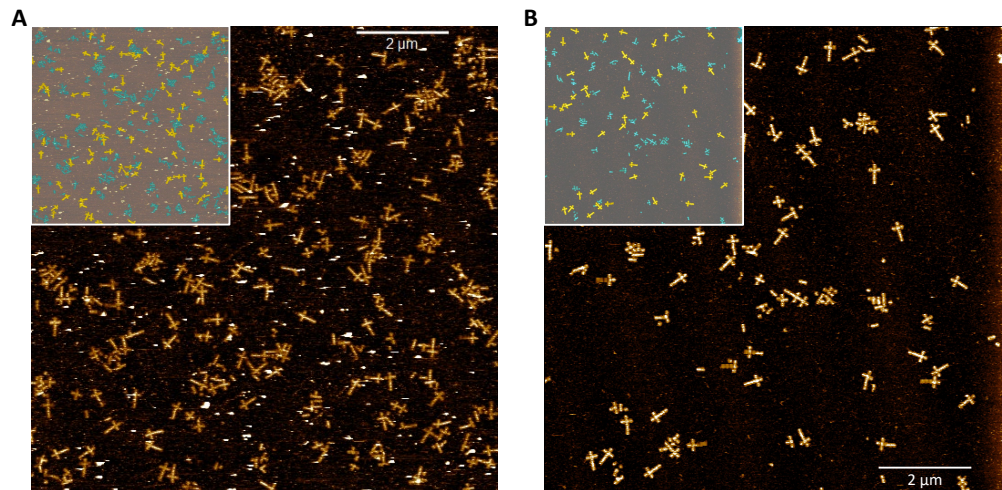


Fig. S10. Yield estimation of the sword assembly. (A) Design1: 38.2%. (B) Design2: 46.5%. The yield was determined as the total number of pixels in complete assemblies of the designed shape (colored in yellow) divided by the total number of pixels above the background threshold (colored in blue and yellow).

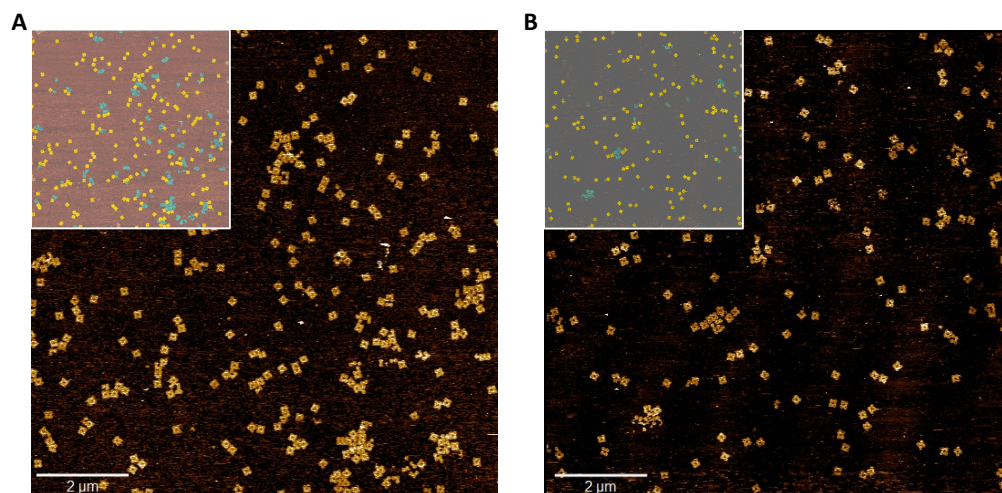


Fig. S11. Yield estimation of the head invader. (A) Design1: 62.8%. (B) Design2: 78.2%. The yield was determined as the total number of pixels in complete assemblies of the designed shape (colored in yellow) divided by the total number of pixels above the background threshold (colored in blue and yellow).

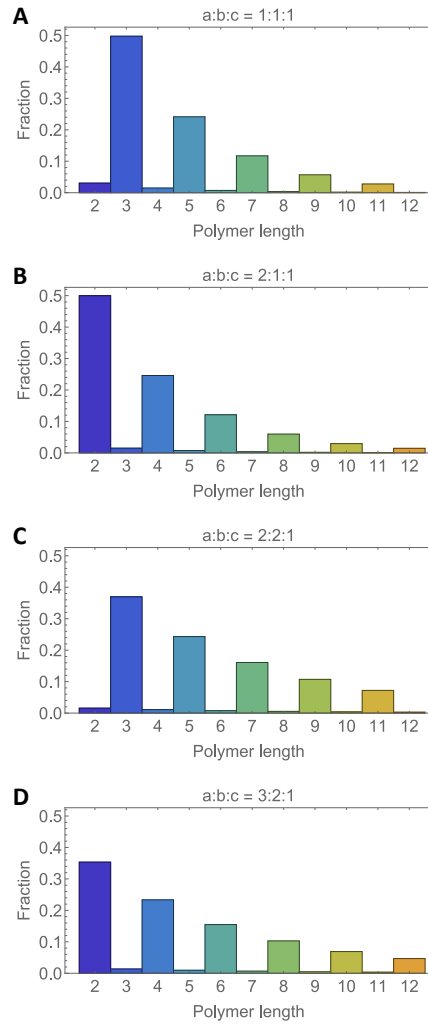


Fig. S12. Simulations of the tail invader with various tile ratios. (A) $a : b : c = 1 : 1 : 1$. (B) $a : b : c = 2 : 1 : 1$. (C) $a : b : c = 2 : 2 : 1$. (D) $a : b : c = 3 : 2 : 1$. Each fraction was calculated as $c_i / \sum c_i$, where c_i is the concentration of polymer of length i .

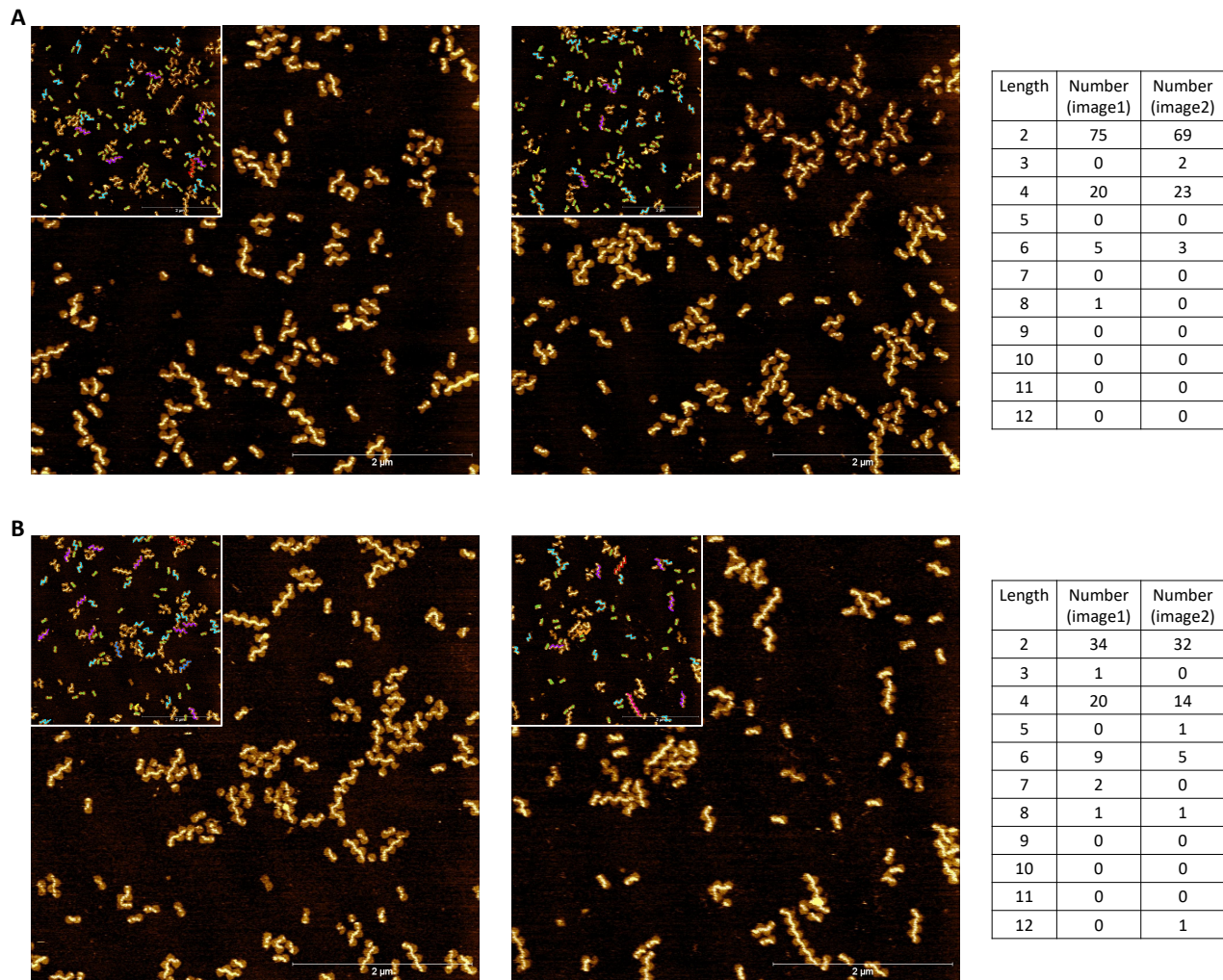


Fig. S13. Length statistics of the tail invader. (A) $a : b : c = 2 : 1 : 1$. (B) $a : b : c = 3 : 2 : 1$. Insets: tile c -containing polymers with distinct lengths are marked with distinct colors.

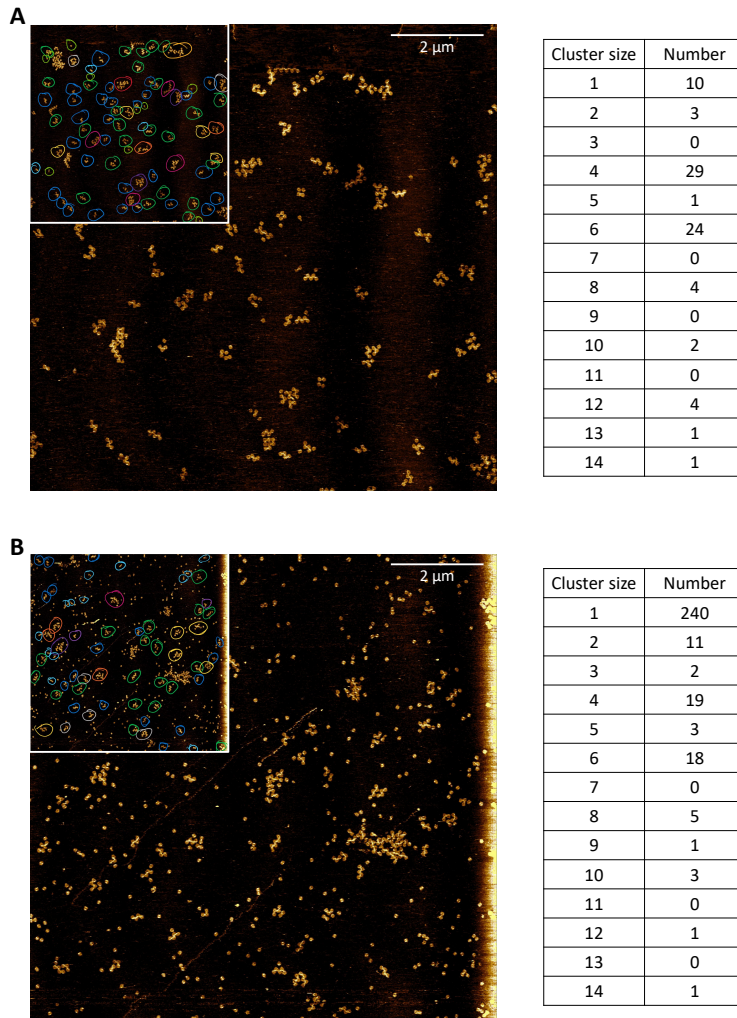


Fig. S14. Size statistics for the evaluation of barrel formation. (A) ab ($a : b = 1 : 1$). (B) $ab + c$ ($a : b : c = 1 : 1 : 2$). Insets: structures and clusters with distinct sizes are circled with distinct colors.

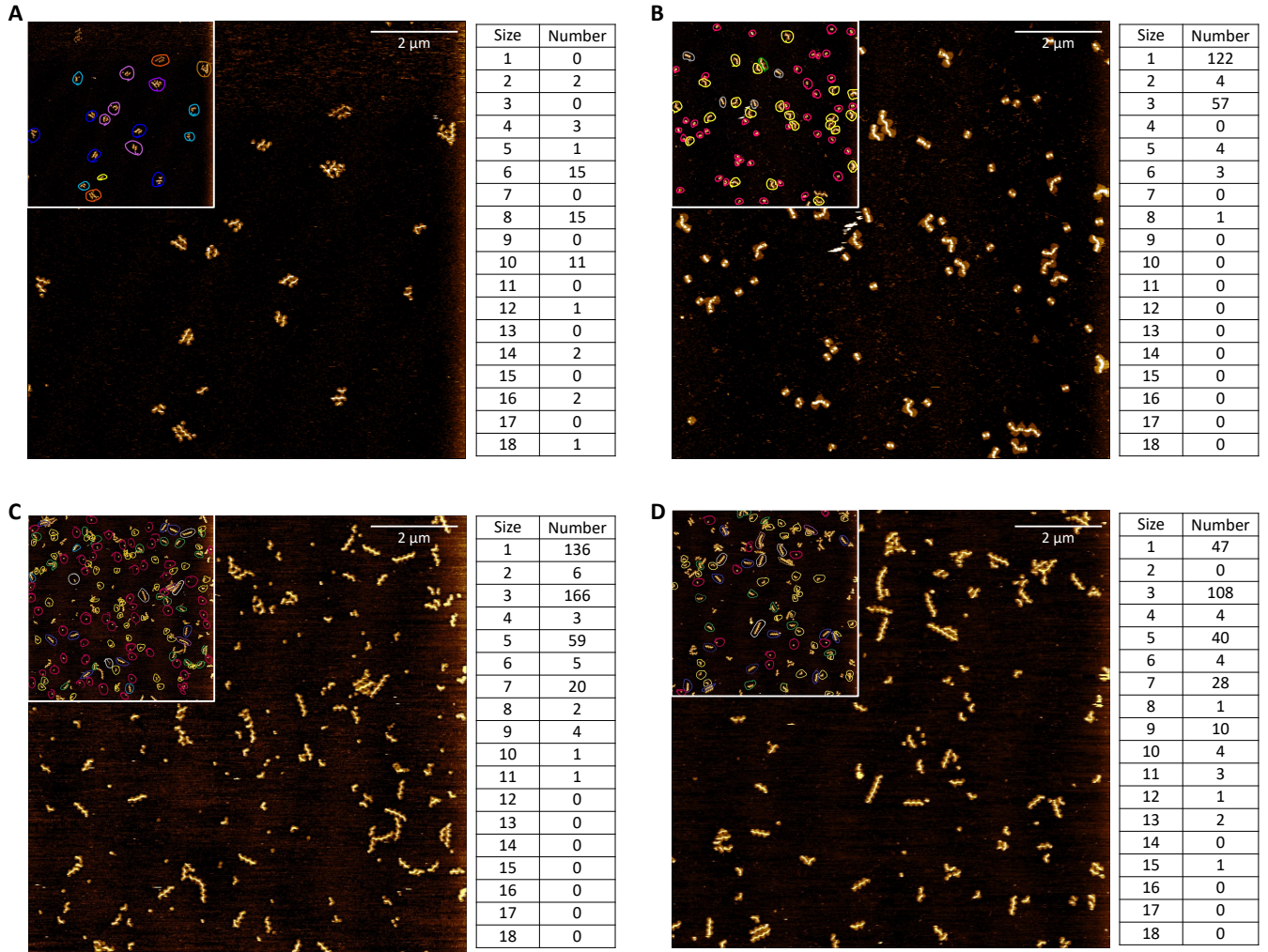


Fig. S15. Size statistics for the reconfiguration of 3D barrels to 2D polymers. (A) ab ($a : b = 1 : 1$). (B) $ab + c$ ($a : b : c = 1 : 1 : 2$). (C) $ab + c$ ($a : b : c = 1 : 1 : 0.5$). (D) $ab + c$ ($a : b : c = 1 : 1 : 0.25$). Insets: structures and clusters with distinct sizes are circled with distinct colors.

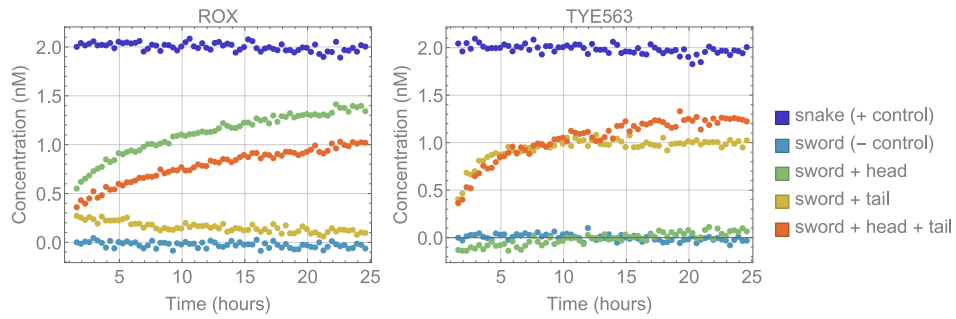


Fig. S16. Fluorescence kinetics data of the sword reconfiguring to the snake. Experiments were performed at 25 °C with the sword, head, and tail at 2, 2.4, and 2.4 nM, respectively. The sword assembly alone was used as a negative control for minimum fluorescence, and the snake assembly annealed at 2 nM was used as a positive control for maximum fluorescence. Raw fluorescence was normalized to concentration by using the average of the first five data points of the negative control as 0 and the average of the last five data points of the positive control as 2 nM.

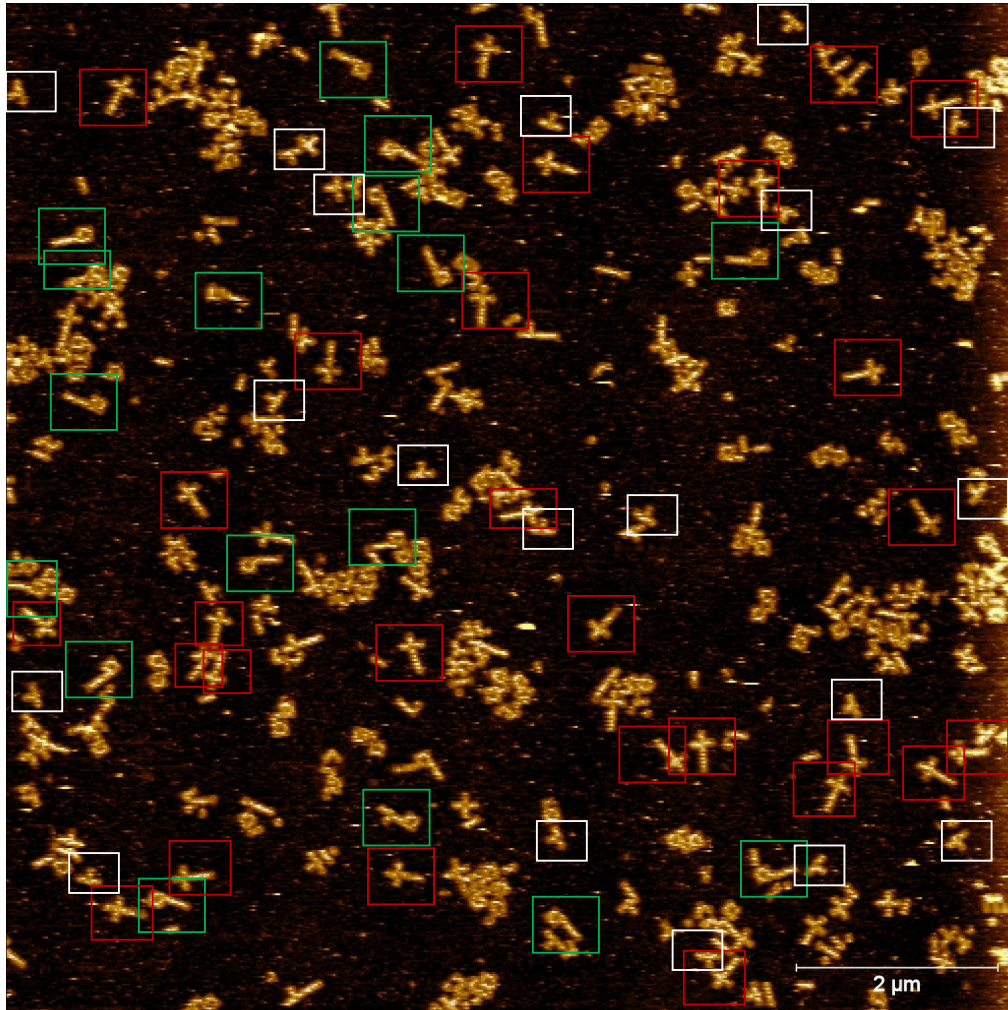


Fig. S17. AFM image of the sword mixed with the head invader alone. Red, green, and white boxes highlight the sword (reactant), head-blade (product), and handle (product) structures, respectively. 28 reactants and 17 or 21 products (head-blade or handle) were counted in this image, based on which the yield of tile displacement was estimated as $37.8 \pm 7.2\%$ or $42.9 \pm 7.1\%$, respectively. The standard error was calculated as $\sqrt{p(1-p)/n}$, where p is the yield and n is the total number of reactants and products, treating the yield as a Bernoulli probability.

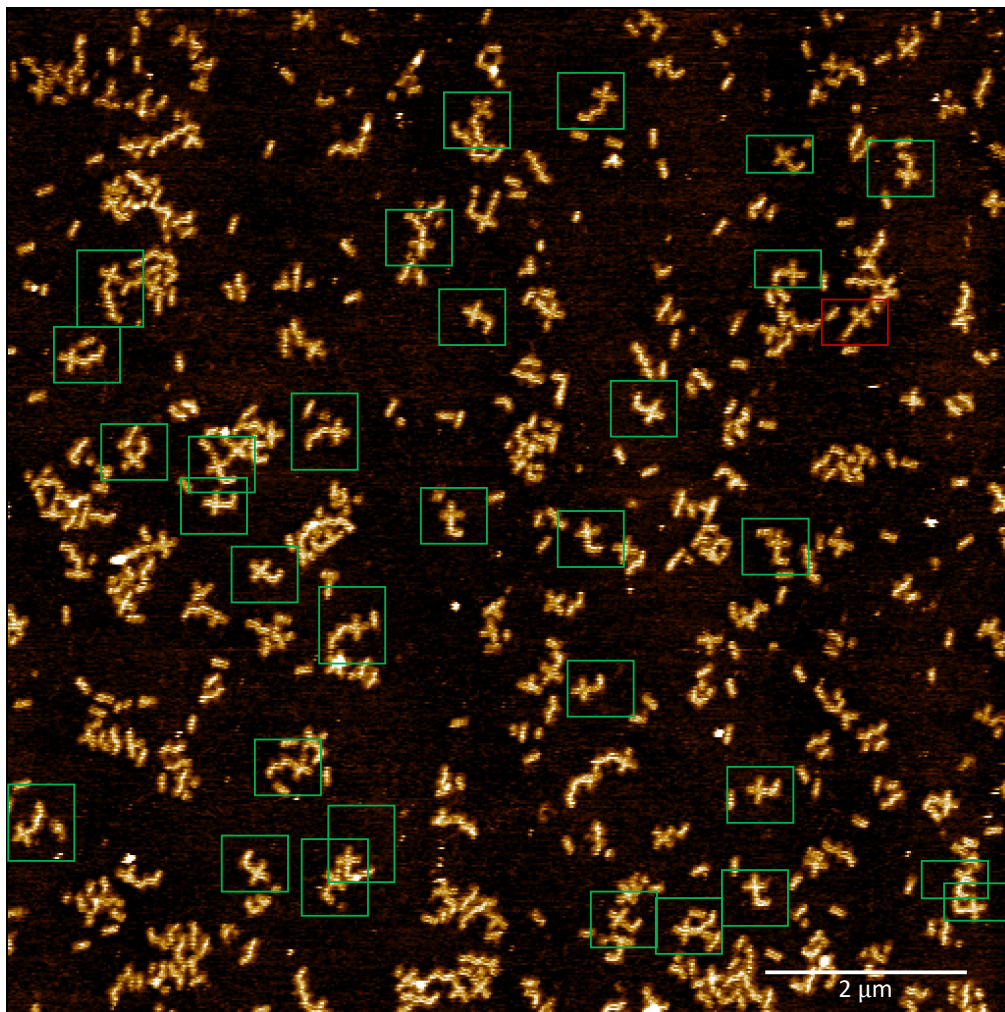


Fig. S18. AFM image of the sword mixed with the tail invader alone. Red and green boxes highlight the sword (reactant) and handle-tail (product) structures, respectively. 1 reactants and 31 products were counted in this image, based on which the yield of tile displacement was estimated as $96.9 \pm 3.1\%$. The standard error was calculated as $\sqrt{p(1-p)/n}$, where p is the yield and n is the total number of reactants and products, treating the yield as a Bernoulli probability.

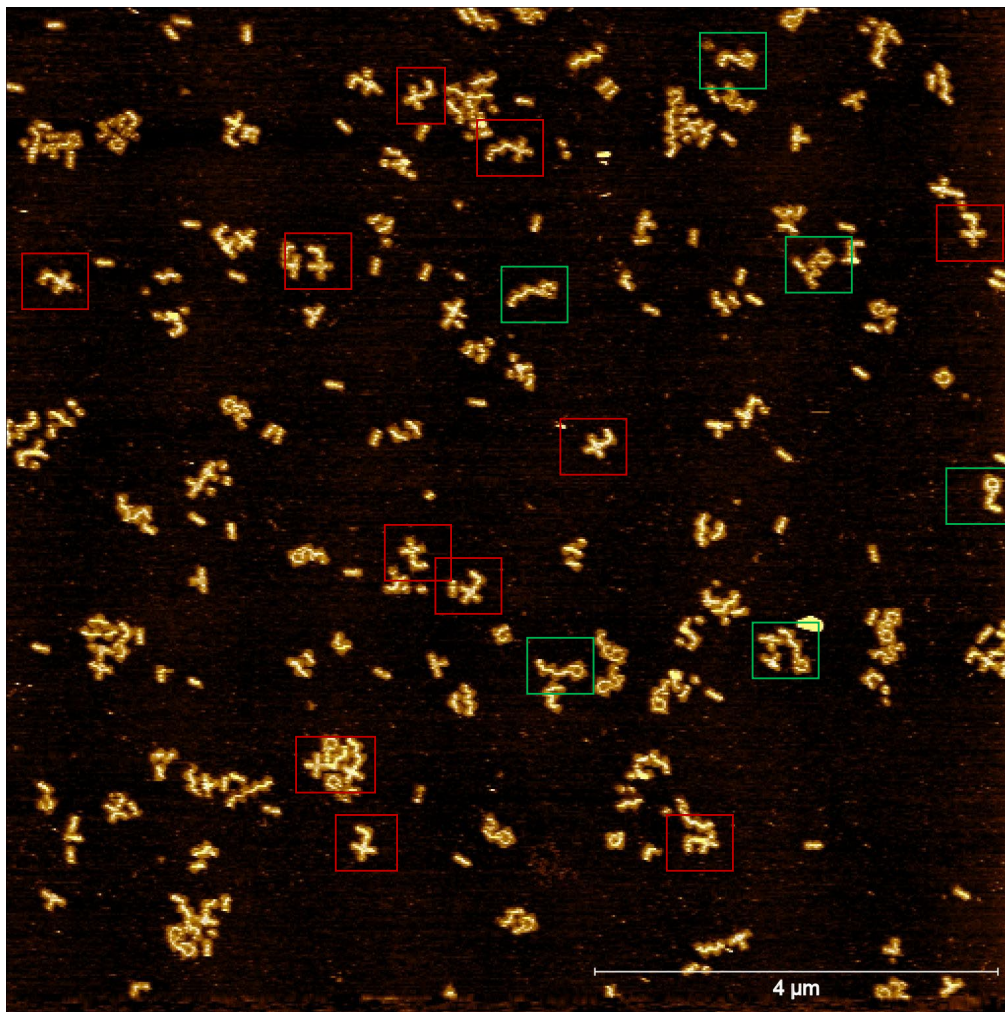


Fig. S19. AFM image of the sword mixed with both the head and tail invaders. Red and green boxes highlight the handle-tail (intermediate) and snake (product) structures, respectively. 0 reactants, 12 intermediates and 6 products were counted in this image, based on which the yield of simultaneous tile displacement was estimated as $33.3 \pm 11.1\%$. The standard error was calculated as $\sqrt{p(1-p)/n}$, where p is the yield and n is the total number of reactants, intermediates, and products, treating the yield as a Bernoulli probability.

Supplementary Tables

Table S1. Interior staples.

Strand name	Sequence
Reg-T1R01C6	TCATTTGCTAATAGTAGTAGCATT
Reg-T1R03C5	CAACTAAAAGTACGGTGGGATGGCT
Reg-T1R03C6	TTTCATTGAGTAGATTTAGTTTCTATATTT
Reg-T1R04C5	TAGAGCTTCAGACCGGAAGCAAACCTATTATA
Reg-T1R05C6	GTCAGGAAGAGGTCATTTTTGCTCTGGAAG
Reg-T1R06C3	TTAAGAGGGTCCAATACTGCGGATAGCGAG
Reg-T1R06C5	GTCAGAAGATTGAATCCCCCTCAACCTCGTTT
Reg-T1R07C4	AAATATTCCAAAGCGGATTGCATCGAGCTTCA
Reg-T1R07C6	AACAGTTAGGTCTTTACCCTGATCCAACAG
Reg-T1R08C3	AGGCTTTTCAGGTAGAAAGATTCAATTACC
Reg-T1R08C5	ACCAGACGGAATACCACATTCAACGAGATGGT
Reg-T1R09C2	CATTATTAGCAAAAAGAAGTTTTGC
Reg-T1R09C4	AGATTTAGACGATAAAAACCAAAAATCGTCAT
Reg-T1R09C6	ATACATACAACACTATCATAACATGCTTTA
Reg-T1R10C1	AGTCAGGACATAGGCTGGCTGACCTTTGAAAG
Reg-T1R10C3	TTATGCGATTGACAAGAACCGGAGGTCAAT
Reg-T1R10C5	TTAATTTCCAACGTAAACAAAGCTGTCCATGTT
Reg-T1R11C2	GAGTAATCTTTTAAGAACTGGCTCCGGAACAA
Reg-T1R11C4	ACCCAAATAACTTTAATCATTGTGATCAGTTG
Reg-T1R11C6	GTGAATATAGTAAATGGGCTTTAATGCAG
Reg-T1R12C3	CATAAGGGACACTAAAACACTCACATTAATA
Reg-T1R12C5	ACTTAGCCATTATACCAAGCGCGAGAGGACTA
Reg-T1R13C2	AAAAGAATAACCGAACTGACCAACTTCATCAA
Reg-T1R13C4	CCCCAGCGGAACGAGGCGCAGACTATTCATT
Reg-T1R13C6	ACAACGGAAATCCGCGACCTGCCTCATTCA
Reg-T1R14C3	CGGGTAAAATTCGGTCGCTGAGGAATGACA
Reg-T1R14C5	AAGACTTTGGCCGCTTTTGCGGGATTAACAG
Reg-T1R15C4	GAGTTAAATTCATGAGGAAGTTTCTCTTTGAC
Reg-T1R15C6	CTCAGCAGGCTACAGAGGCTTTAACAAGT
Reg-T1R16C5	CTTGATACTGAAAATCTCCAAAAAGCGGAGT
Reg-T1R17C4	TTTCACGTCGATAGTTGCGCCGACCTTGCAGG
Reg-T1R17C6	CAAAGGTTTCGAGGTGAATTTCTCGTCACC
Reg-T1R19C6	GTTAGTAACTTTCAACAGTTTCAAAGGCTC
Reg-T1R21C5	CCATGTACCGTAACACTGTAGCATTCCACAGATTCCAGAC
Reg-T2R01C6	ACCCTCATTGAGGATAGCAAGCC
Reg-T2R03C5	TTAGGATTAGCGGGTGGAACCTA
Reg-T2R03C6	GTACCAGGTATAGCCCGGAATAGAACCGCC
Reg-T2R04C5	TTATTCTGACTGGTAATAAGTTTTAACAAATA
Reg-T2R05C6	CAGTGCCCCCTGCCTATTTCTTTGCTCA
Reg-T2R06C3	GTCTCTGACACCCTCAGAGCCACATCAAAA
Reg-T2R06C5	AATCCTCAACCAGAACACCACCAGCCCCCTT
Reg-T2R07C4	GAGCCGCTTAAAGCCAGAATGGAGATGATAC
Reg-T2R07C6	GCCAGCAGCCTTGATATTCACAAAACGGGGT
Reg-T2R08C3	TCACCGGAAACGTCACCAATGAATTATTCA
Reg-T2R08C5	ATTAGCGTCCGTAATCAGTAGCGAATTGAGGG
Reg-T2R09C2	AGGCCGGAACCCAGAGCCACCACCG
Reg-T2R09C4	TAGCAGCATTGCCATCTTTTCATACACCCTCA
Reg-T2R09C6	AGTTTGGCATTTCGGTCATAGAGCCGCC
Reg-T2R10C1	GCCATTTGCAAACGTAGAAAATACCTGGCATG
Reg-T2R10C3	TTAAAGGTACATATAAAAAGAAACAAACGCA
Reg-T2R10C5	AGGGAAGGATAAGTTTATTTTGTGAGCCGAAC
Reg-T2R11C2	AGGTGGCAGAATTATCACCGTCACCATTAGCA
Reg-T2R11C4	ACCACGGATAAATATTGACGGAAAACCATCGA

Strand name	Sequence
Reg-T2R11C6	TAGAAAAGGCGACATTCAACCGCAGAATCA
Reg-T2R12C3	ATAATAACTCAGAGAGATAACCCGAAGCGC
Reg-T2R12C5	AAAGTTACGCCAATAATAAGAGCAGCCTTFA
Reg-T2R13C2	CGCTAATAGGAATACCCAAAAGAAATACATAA
Reg-T2R13C4	TGAGTTAACAGAAGGAAAACCGAGGGCAAAGAC
Reg-T2R13C6	ATGAAATGAAAAGTAAGCAGATACAATCAA
Reg-T2R14C3	ATTAGACGGAGCGTCTTTCCAGAGCTACAA
Reg-T2R14C5	CAGAGAGAACAAAATAAACAGCCATTAATCA
Reg-T2R15C4	TGCCAGTTATAACATAAAAACAGGACAAGAAT
Reg-T2R15C6	ATCCCAAAAAAATGAAAATAGCAAGAAAACA
Reg-T2R16C5	AGATTAGTATATAGAAGGCTTATCCAAGCCGT
Reg-T2R17C4	CAAATCAGTGCTATTTTGCACCCAGCCTAATT
Reg-T2R17C6	TAAGAACGGAGGTTTTGAAGCCTATTATTT
Reg-T2R19C6	CTTATCACTCATCGAGAACAAGCGGTATTC
Reg-T2R21C5	AGCTAATGCAGAACGGAGAAAAATAATATCCTGTCTTTC
Reg-T3R01C6	AGAATATCAGACGACGACAATAAA
Reg-T3R03C5	TCATATGCGTTATACAAAGGCGTT
Reg-T3R03C6	CCAGTATGAATCGCCATATTTAGTAATAAG
Reg-T3R04C5	AAATAAGAACTTTTTCAAATATATCTGAGAGA
Reg-T3R05C6	ATTTTCATGACCGTGTGATAAATAATTCTTA
Reg-T3R06C3	TATATAACGTAATCGTCGCTATATTTGAA
Reg-T3R06C5	CTACCTTTAGAAATCCTTGAAAACAAGAAAACA
Reg-T3R07C4	TTCCCTTTTAACTCCGGCTTAGCAAAGAAC
Reg-T3R07C6	GCTTAGAATCAAAATCATAGGTTTTAGTTA
Reg-T3R08C3	TTACCTTTACAATAACGGATTTCGCAAAATT
Reg-T3R08C5	AAATTAATACCAAGTTACAAAATCCTGAATAA
Reg-T3R09C2	CGGGAGAATTTAATGGAAACAGTA
Reg-T3R09C4	CTTTGAATTACATTTAACAATTTCTAATTAAT
Reg-T3R09C6	GCGAATTATGAAACAAACATCATAGCGATA
Reg-T3R10C1	GTAGATTTGTTATTAATTTTAAAAACAATTC
Reg-T3R10C3	ATTTGCACCATTTTTCGGGAACAAATTTGAG
Reg-T3R10C5	TGGAAGGGAGCGGAATTATCATCAACTAATAG
Reg-T3R11C2	AACATTATGTAACAGAAATAAATTTTACAT
Reg-T3R11C4	CCAGAAGGTTAGAACCTACCATATCCTGATTG
Reg-T3R11C6	ATTATCAGTTTGGATTATACTTGGCGAGAG
Reg-T3R12C3	GATTTAGATTGCTGAACCTCAAAGTATTA
Reg-T3R12C5	ATTAGAGCAATATCTGGTCAGTTCAGCAGAA
Reg-T3R13C2	GCATCACCAGTATTAGACTTTACAGTTTGTAGT
Reg-T3R13C4	CCTCAATCCGTCAATAGATAATACAGAAACCA
Reg-T3R13C6	ACAGTTGTTAGGAGCACTAACATATTCCTG
Reg-T3R14C3	CACCGCCTGAAAGCGTAAGAATACATTCTG
Reg-T3R14C5	GATAAACTTTTTGAATGGCTATTTTCACCAG
Reg-T3R15C4	AGACAATAAGAGGTGAGGCGTCATATCAAAC
Reg-T3R15C6	ATGCGGTACCGAACGAACCACGCAAATCA
Reg-T3R16C5	TCACACGATGCAACAGGAAAAACGGAAGAACT
Reg-T3R17C4	CCAGCCATCCAGTAATAAAGGGACGTGGCAC
Reg-T3R17C6	AATACCTATTTACATTGGCAGAAGTCTTTA
Reg-T3R19C6	TTAACCCTCACTTGCTGAGTACTCATGGA
Reg-T3R21C5	CTAAACAGGAGCCGATAATCCTGAGAAGTGCACGAAA
Reg-T4R01C6	GCGCGTACTTTTCTCGTTAGAATC
Reg-T4R03C5	AAAGCCGGCGAACGTGTGCCGTAA
Reg-T4R03C6	GGAAGGGGCAAGTGTAGCGGTGCTACAGG
Reg-T4R04C5	AGCACTAAAAAGGGCGAAAAACCGAAATCCCT
Reg-T4R05C6	GGCGATGTTTTTGGGGTCGAGGGCGAGAAA
Reg-T4R06C3	TGAGTGTTCAGCTGATTGCCCTTGGCGGG
Reg-T4R06C5	TATAAATCGAGAGTTGCAGCAAGCGTCGTGCC
Reg-T4R07C4	GGCCCTGAAAAAGAATAGCCCGAGCGTGGACT

Strand name	Sequence
Reg-T4R07C6	CTGGTTTGTTCGAAATCGGCATCTATCAG
Reg-T4R08C3	GAGAGGCGACAACATACGAGCCGCTGCAGG
Reg-T4R08C5	AGCTGCATAGCCTGGGGTGCCTAAGTAAAACG
Reg-T4R09C2	AATTCCACGTTTTCGGTATTGGGCG
Reg-T4R09C4	AAGTGTAAATAATGAATCGGCCAACCCGCCT
Reg-T4R09C6	CTAACTCCCAGTCGGGAAACCTGGTCCACG
Reg-T4R10C1	GAATTCGTGCCATTGCCATTAGTTCGGCA
Reg-T4R10C3	TCGACTCTGAAGGGCGATCGGTGCGGCCTC
Reg-T4R10C5	ACGGCCAGTACGCCAGCTGGCGAACATCTGCC
Reg-T4R11C2	ACTGTTGAGAGGATCCCCGGTACCGCTCAC
Reg-T4R11C4	TTCGCTATTGCCAAGCTTGCATGCGAAGCATA
Reg-T4R11C6	GTGCTGCCCCAGTCACGACGTTTGAGTGAG
Reg-T4R12C3	AGGAAGATCATTAAATGTGAGCGTTTTTAA
Reg-T4R12C5	AGTTTGAGATTCTCCGTGGGAACAATTCGCAT
Reg-T4R13C2	TTCATCAACGCACTCCAGCCAGCTGCTGCGCA
Reg-T4R13C4	CCCGTCGGGGACGACGACAGTATCGGGCCTC
Reg-T4R13C6	ATTGACCCGCATCGTAACCGTGAGGGGAT
Reg-T4R14C3	CCAATAGGAAACTAGCATGTCAAGGAGCAA
Reg-T4R14C5	TAAATTTTGTATAATCAGAAAAGCACAAGGC
Reg-T4R15C4	ACCCCGTTGTAAATCAGCTCATAGTAACAA
Reg-T4R15C6	CAGGAAGTAATATTTGTAAAAACGGCGG
Reg-T4R16C5	TATCAGGTAATCACCATCAATATCAATGCCT
Reg-T4R17C4	AGACAGTCCATTGCCTGAGAGTCTTCATATGT
Reg-T4R17C6	ACCGTTCATTTTGTAGAGATCTCCAAAAA
Reg-T4R19C6	CCTTTATCATATATTTTAAATGGATATTCA
Reg-T4R21C5	AATCATACAGGCAAGGCAGAGCATAAAGCTAAGGGAGAAG

Table S2. Bridge staples.

Strand name	Sequence
Bri-T1R02C5	GATACATTTTCGCTTTTTTTGACCCTGTAAT
Bri-T1R05C4	AAGCGAACAATTGCTGAATATAATGCTGTATTTTTTTGTGAGAAAGGCCGG
Bri-T1R07C2	TGGATAGCAAGCCCGATTTTTAATCGTAAACGCCAT
Bri-T1R08C1	CAGAGGGGGTTTTGCCTTCCTGTAGCCAGCT
Bri-T1R12C1	AGGACAGATGATTTTTTTCACCAGTAGCACCATTACCGACTTGA
Bri-T1R14C2	TGCCACTACTTTTTTTTGCACCCTC
Bri-T1R16C3	ACAACCATTTTTTCATACATGGCTTTTAAGCGCA
Bri-T1R18C5	GAGAATAGAAAGGAACAACACTATTTTCTCAAGAGAAGGA
Bri-T1R19C5	TGTCGTCTCAGCCCTCATATTTTTTTTCGCCACCCTCAGGTGTATC
Bri-T2R02C5	ACCGTACTCAGGTTTTTGATCTAAAGTTT
Bri-T2R05C4	AGGAGTGTAAACATGAAAGTATTAAGAGGCTTTTTTTGCGAATAATAATTT
Bri-T2R07C2	AGAACCGCATTTACCGTTTTACCGATATATACGTAA
Bri-T2R08C1	GAACCGCTCTTTACCTAAAACGAAAGAGGC
Bri-T2R10C0	GGAATTAGAGCTTTTTTTTCAGACCAGGCGGTTGGGAAGATTTTTTTTCCAGGCAAAGC
Bri-T2R12C1	ATTAAGACTCCTTTTTAATATACAGTAACAGTACCGAAATTGC
Bri-T2R14C2	AACTGAACATTTTTTTTGAATAACC
Bri-T2R16C3	TTTTATCTTTTTATCCAATCGCAAGAGTTGGGT
Bri-T2R18C5	TTTTATTTTCATCGTAGGAATTTTAGCCTGTTAGTA
Bri-T2R19C5	TAATCGGCCATCCTAATTTTTTTTTTTTTTCGAGCCAACAACGCC
Bri-T3R02C5	AACATGTAATTTTTTTTGAACCAATCAA
Bri-T3R05C4	GCGAGAAAATAAACCCGGAATCATAATTATTTTTTTTCGCCCAATAGCAAG
Bri-T3R07C2	TTGCTTCTTATATGTATTTTACGCTAACGGAGAATT
Bri-T3R08C1	CATAAATCAATTTAGTCAGAGGGTAATTGAG
Bri-T3R12C1	GACAACCTCGTATTTTTTTCCTGTGTGAAATTGTTATCCGAGCTC
Bri-T3R14C2	GCCACGCTGTTTTTTTACCAGTGAG
Bri-T3R16C3	GCCAACATTTTTTCCACTATTAAGAAATAGGGT
Bri-T3R18C5	CAAACATCGGCCTTGCTGGTTTTTGTAGCTTGACGGG
Bri-T3R19C5	CTGTCCATTTTTATAATCATTTTTTTCTTAATGCGCCCACGCTGC
Bri-T4R02C5	GCGTAACCACCATTTTTGAGTAAAAGAGT
Bri-T4R05C4	CCAACGTATCGGAACCCTAAAGGGAGCCCTTTTTTTGAACAATATTACCG
Bri-T4R07C2	ACGGGCAAGTTCAGTTTTTTCTGACCTGCAACAGT
Bri-T4R08C1	CCAGGGTGGTTTTGCAAATGAAAAATCTAAA
Bri-T4R10C0	AATCATGGTCATTTTTTTTTTGCCCGAACTCAGGTTAACTTTTTTTTTCAGTATGTTAG
Bri-T4R12C1	CCGCTTCTGGTTTTTTTCGTTAATAAAAACGAACTAAATTATACC
Bri-T4R14C2	CAAAAATAATTTTTTTTGTAGAC
Bri-T4R16C3	ACAAGAGTTTTTTTCGCGTTTTAATCAAAAAGA
Bri-T4R18C5	GAGTAATGTGTAGGTAAAGATTTTTTGTGTTTTAAATATG
Bri-T4R19C5	ACTTTTGCATCGGTTGTACTTTTTTTAACCTGTTTAGGACCATTA

Table S3. Pattern staples.

Strand name	Sequence
ssEx-Reg-T1R01C6	TCATTTGCTAATAGTAGTAGCATTTTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T1R03C5	CAACTAAAGTACGGTGGGATGGCTTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T1R03C6	TTCATTGAGTAGATTTAGTTTCTATATTTTTTTTTTTTTTTTTT
ssEx-Reg-T1R04C5	TAGAGCTTCAGACCGGAAGCAAACCTATTATATTTTTTTTTTTT
ssEx-Reg-T1R05C6	GTCAGGAAGAGGTCATTTTGTCTGGAAGTTTTTTTTTTTTTTTT
ssEx-Reg-T1R06C3	TTAAGAGGGTCCAATACTGCGGATAGCGAGTTTTTTTTTTTTTTT
ssEx-Reg-T1R06C5	GTCAGAAGATTGAATCCCCTCAACCTCGTTTTTTTTTTTTTTTTT
ssEx-Reg-T1R07C4	AAATATTCCAAAGCGGATTGCATCGAGCTTCATTTTTTTTTTTTTT
ssEx-Reg-T1R07C6	AACAGTTAGGTCCTTACCTGATCCAACAGTTTTTTTTTTTTTTTT
ssEx-Reg-T1R08C3	AGGCTTTTCAGGTAGAAAGATTCAATTACCTTTTTTTTTTTTTTT
ssEx-Reg-T1R08C5	ACCAGACGGAATACCACATTCAACGAGATGGTTTTTTTTTTTTTT
ssEx-Reg-T1R09C2	CATTATTAGCAAAGAAGTTTGTCTTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T1R09C4	AGATTTAGACGATAAAAAACCAAAAATCGTCATTTTTTTTTTTTTT
ssEx-Reg-T1R09C6	ATACATACAACACTATCATAACATGCTTATTTTTTTTTTTTTTTTT
ssEx-Reg-T1R10C1	AGTCAGGACATAGGCTGGCTGACCTTTGAAAGTTTTTTTTTTTTTT
ssEx-Reg-T1R10C3	TTATGCGATTGACAAGAACCGGAGGTCAATTTTTTTTTTTTTTTTT
ssEx-Reg-T1R10C5	TTAATTTCCAACGTAACAAAGCTGTCCATGTTTTTTTTTTTTTTTT
ssEx-Reg-T1R11C2	GAGTAATCTTTAAGAAGTGGCTCCGGAACAATTTTTTTTTTTTTTT
ssEx-Reg-T1R11C4	ACCCAAATAACTTTAATCATTGTGATCAGTTGTTTTTTTTTTTTTTT
ssEx-Reg-T1R11C6	GTGAATATAGTAAATTGGGCTTTAATGCAGTTTTTTTTTTTTTTTTT
ssEx-Reg-T1R12C3	CATAAGGGACACTAAAACACTCACATTAATTTTTTTTTTTTTTTTT
ssEx-Reg-T1R12C5	ACTTAGCCATTATACCAAGCGGAGAGGACTATTTTTTTTTTTTTTTTT
ssEx-Reg-T1R13C2	AAAAGAATAACCGAAGTACCAACTCATCAATTTTTTTTTTTTTTTTT
ssEx-Reg-T1R13C4	CCCAGCGGAACGAGGCGCAGACTATTCATTTTTTTTTTTTTTTTTT
ssEx-Reg-T1R13C6	ACAACGGAATCCGCGACCTGCCTCATTCTTTTTTTTTTTTTTTTTT
ssEx-Reg-T1R14C3	CGGGTAAAATTGCGTCTGAGGAATGACATTTTTTTTTTTTTTTTTT
ssEx-Reg-T1R14C5	AAGACTTTGGCCGCTTTTGGCGGATTAACAGTTTTTTTTTTTTTTTTT
ssEx-Reg-T1R15C4	GAGTTAAATTCATGAGGAAGTTTCTCTTTGACTTTTTTTTTTTTTTTTT
ssEx-Reg-T1R15C6	CTCAGCAGGCTACAGAGGCTTTAACAAAGTTTTTTTTTTTTTTTTTT
ssEx-Reg-T1R16C5	CTTGATACTGAAAATCTCCAAAAAGCGGAGTTTTTTTTTTTTTTTTT
ssEx-Reg-T1R17C4	TTTCACGTCGATAGTTGCGCCGACCTTGCAGGTTTTTTTTTTTTTTTT
ssEx-Reg-T1R17C6	CAAAAGGTTTCGAGGTGAATTTCTCGTCACCTTTTTTTTTTTTTTTTT
ssEx-Reg-T1R19C6	GTTAGTAACCTTCAACAGTTTCAAAGGCTCTTTTTTTTTTTTTTTTTT
ssEx-Reg-T1R21C5	CCATGTACCCTAACACTGTAGCATTCCACAGATTCAGACTTTTTTTTTTTTTTTT
ssEx-Reg-T2R01C6	ACCCTCATTACGGGATAGCAAGCCTTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R03C5	TTAGGATTAGCGGGTGAACCTATTTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R03C6	GTACCAGGTATAGCCCAGGAATAGAACCGCCTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R04C5	TTATTCTGACTGGTAATAAGTTTTTAACAAATATTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R05C6	CAGTGCCCCCCTGCCTATTTCTTTGTCTATTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R06C3	GTCTCTGACACCCTCAGAGCCACATCAAAATTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R06C5	AATCCTCAACCAGAACCACCAGCCCTTTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R07C4	GAGCCGCTTAAAGCCAGAATGGAGATGATACTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R07C6	GCCAGCAGCCTTGATATTCACAAACGGGGTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R08C3	TCACCGAAACGTCAACCAATGAATTATTCATTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R08C5	ATTAGCGTCCGTAATCAGTAGCGAATTGAGGGTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R09C2	AGGCCGGAACCAGAGCCACCACCGTTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R09C4	TAGCAGCATTGCCATCTTTTCATACACCCTCATTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R09C6	AGTTTGGCATTTCGGTCATAGAGCCGCTTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R10C1	GCCATTTGCAAACGTAGAAAAATACCTGGCATGTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R10C3	TTAAAGGTACATATAAAGAAGAAACAAACGCATTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R10C5	AGGAAGGATAAGTTTATTTTGTGTCAGCCGAACTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R11C2	AGGTGGCAGAATTATCACCGTCACCATTAGCATTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R11C4	ACCACGGATAAATATTGACGGAAAACCATCGATTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R11C6	TAGAAAAGCGGACATTCAACCGCAGAATCATTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R12C3	ATAATAACTCAGAGAGATAACCCGAAGCGCTTTTTTTTTTTTTTTTTT

Strand name	Sequence
ssEx-Reg-T2R12C5	AAAGTTACGCCAATAATAAGAGCAGCCTTTATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R13C2	CGCTAATAGGAATACCCAAAAGAAATACATAATTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R13C4	TGAGTTAACAGAAGGAAACCGAGGGCAAAGACTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R13C6	ATGAAATGAAAAGTAAGCAGATACAATCAATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R14C3	ATTAGACGGAGCGTCTTTCCAGAGCTACAATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R14C5	CAGAGAGAACAAAATAAACAGCCATTAATATCATTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R15C4	TGCCAGTTATAACATAAAAAACAGGACAAGAATTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R15C6	ATCCCAAAAAAATGAAAATAGCAAGAAACATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R16C5	AGATTAGTATATAGAAGGCTTATCCAAGCCGTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R17C4	CAAATCAGTGCTATTTTGACCCAGCCTAATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R17C6	TAAGAACGGAGGTTTTGAAGCCTATTATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R19C6	CTTATCACTCATCGAGAACAAGCGGTATTCTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T2R21C5	AGCTAATGCAGAACGCGAGAAAAATAATATCCTGTCTTCTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R01C6	AGAATATCAGACGACGACAATAAATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R03C5	TCATATGCGTTATACAAAGGCGTTTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R03C6	CCAGTATGAATCGCCATATTTAGTAATAAGTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R04C5	AAATAAGAACTTTTTCAAATATATCTGAGAGATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R05C6	ATTTTCATGACCGTGTGATAAATAATCTTATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R06C3	TATATAACGTAAATCGTCGCTATATTTGAATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R06C5	CTACCTTTAGAATCCTTGAAAACAAGAAAACATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R07C4	TTCCCTTTTAACTCCGGCTTAGCAAAGAACTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R07C6	GCTTAGAATCAAATCATAGGTTTGTAGTTATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R08C3	TTACCTTTACAATAACGGATTTCGAAAAATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R08C5	AAATTAATACCAAGTTACAAAATCCTGAATAATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R09C2	CGGGAGAATTTAATGGAAACAGTATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R09C4	CTTTGAATTACATTTAACAATTTCTAATTAATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R09C6	GCGAATTATGAAACAAACATCATAGCGATATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R10C1	GTAGATTTGTTATTAATTTTAAAAACAATTCCTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R10C3	ATTTGCACCATTTTGCGGAACAAATTTGAGTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R10C5	TGGAAGGGAGCGGAATTATCATCAACTAATAGTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R11C2	AACATTATGTA AACAGAAATAAATTTTACATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R11C4	CCAGAAGGTTAGAACCTACCATATCCTGATTGTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R11C6	ATTATCAGTTTGGATTATACTTGCGCAGAGTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R12C3	GATTTAGATTGCTGAACCTCAAAGTATTAATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R12C5	ATTAGAGCAATATCTGGTCAGTTGCAGCAGAATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R13C2	GCATCACCAGTATTAGACTTTACAGTTTGTAGTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R13C4	CCTCAATCCGTC AATAGATAATACAGAAACCATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R13C6	ACAGTTGTTAGGAGCACTAACATATTCCTGTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R14C3	CACCGCCTGAAAGCGTAAGAATACATTCTGTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R14C5	GATAAACTTTTTGAATGGCTATTTTCACCAGTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R15C4	AGACAATAAGAGGTGAGGCGTCATATCAAACTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R15C6	ATGCGCGTACCGAACGAACCACGCAAAATCATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R16C5	TCACACGATGCAACAGGAAAACGGAAGAACTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R17C4	CCAGCCATCCAGTAATAAAGGGACGTGGCACTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R17C6	AATACCTATTTACATTGGCAGAAGTCTTATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R19C6	TTAACCGTCACTTGCCTGAGTACTCATGGATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T3R21C5	CTAAACAGGAGGCCGATAATCCTGAGAAGTGTACGCAAATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R01C6	GCGCGTACTTTCCCTCGTTAGAATCTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R03C5	AAAGCCGGCGAACGTGTGCCGAATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R03C6	GGAAGGGGCAAGTGTAGCGGTGCACAGTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R04C5	AGCACTAAAAAGGGCGAAAAACCGAAATCCCTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R05C6	GGCGATGTTTTGGGGTCGAGGGCGAGAAATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R06C3	TGAGTGTTTCAGCTGATTGCCCTTGCGCGGTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R06C5	TATAAATCGAGAGTTGCAGCAAGCGTCGTGCCTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R07C4	GGCCCTGAAAAAGAATAGCCGAGCGTGGACTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R07C6	CTGGTTTGTCCGAAATCGGCATCTATCAGTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R08C3	GAGAGGCGACAACATACGAGCCGCTGCAGTTTTTTTTTTTTTTTTTTT

Strand name	Sequence
ssEx-Reg-T4R08C5	AGCTGCATAGCCTGGGGTGCCTAAGTAAAACGTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R09C2	AATCCACGTTTGCCTATTGGGCGTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R09C4	AAGTGTAAATAATGAATCGGCCAACCCACGCCTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R09C6	CTAACTCCCAGTCGGGAAACCTGGTCCACGTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R10C1	GAATTCGTGCCATTCCGCCATTAGTTCGGCATTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R10C3	TCGACTCTGAAGGGCGATCGGTGCGGCCTCTTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R10C5	ACGGCCAGTACGCCAGCTGGCGAACATCTGCCTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R11C2	ACTGTTGGAGAGGATCCCCGGTACCGCTCACTTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R11C4	TTCGCTATTGCCAAGCTTGCATGCGAAGCATATTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R11C6	GTGCTGCCCCAGTCACGACGTTTGAGTGAGTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R12C3	AGGAAGATCATTAATGTGAGCGTTTTTAATTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R12C5	AGTTTGAGATTCTCCGTGGGAACAATTCGCATTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R13C2	TTCATCAACGCACTCCAGCCAGCTGCTGCGCATTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R13C4	CCCGTCGGGGACGACGACAGTATCGGGCCTCTTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R13C6	ATTGACCCGCATCGTAACCGTGAGGGGATTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R14C3	CCAATAGGAACTAGCATGTCAAGGAGCAATTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R14C5	TAAATTTTGATAATCAGAAAAGCACAAAGGCTTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R15C4	ACCCCGTTGTAAATCAGCTCATAGTAACAATTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R15C6	CAGGAAGTAATATTTTGTAAAAACGGCGTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R16C5	TATCAGGTAATCACCATCAATATCAATGCCTTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R17C4	AGACAGTCCATTGCCTGAGAGTCTTCATATGTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R17C6	ACCGTTCATTTTGAGAGATCTCCAAAAATTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R19C6	CCTTTATCATATATTTTAAATGGATATTCATTTTTTTTTTTTTTTTTTTTT
ssEx-Reg-T4R21C5	AATCATACAGGCAAGGCAGAGCATAAAGCTAAGGAGAAGTTTTTTTTTTTTTTTT

Table S4. Negation strands.

Strand name	Sequence
Neg-T1R00C7	TTTTCAGCTCGGCCCTAGAATTGATGCCACC
Neg-T1R02C7	ATCAACTGTTATATGGGTTGCGAGAATTGGGA
Neg-T1R04C7	TAAAGGTACTCTCTAATATCAAAAGGAGCAAT
Neg-T1R06C7	TCATTCTCGTTTTCTGGATTTTTGATTATGG
Neg-T1R08C7	TAATTCCTTTTGGCGTCTTACTATGCCTCG
Neg-T1R10C7	TCGTCAGGGCAAGCCTCTCGTTCTGGTGTTC
Neg-T1R12C7	GCGATGATACAAAATCTCGACACAATTTATCAG
Neg-T1R14C7	CGATGCTGTCTTTCGCGTTGCTACCCTCGTTC
Neg-T1R16C7	GATACAATTAAGGCTAGCAAGCTGATAAACC
Neg-T1R18C7	ATACAGAAAATTCATTTGTTTAGCAAAATCCC
Neg-T1R20C7	ACTGGTGACGAAACTCAGGCGTTGTAGTTGT
Neg-T2R00C7	CTGAGGGTGGCGGTTCAATGAGGGTGGTGGCT
Neg-T2R02C7	GACGGCACTTATCCGCTTATATCAACCCTCTC
Neg-T2R04C7	GGGCACTGTTACTCAACATTAAGTTTATAC
Neg-T2R06C7	CTCAACCTCCTGTCAACAATCGTCTGACCTGC
Neg-T2R08C7	CAGTCTGACGCTAAAGCGATGAAAACGGGCTA
Neg-T2R10C7	TGGTAAACCATATGAACTTTGTCTTTGGCGC
Neg-T2R12C7	TAAGATAGCTATTGCTTTAAAAAGGGCTTCGG
Neg-T2R14C7	TCGTTTCTTATTTGGAGACGTTAAACAAAAAA
Neg-T2R16C7	CGCTAAACGCCTCGCCGCAAGTCGGGAGGTT
Neg-T2R18C7	ATACCCGTTCTTGAATGCGGACTTGGTTTA
Neg-T2R20C7	ATTGTTGATAAACAGGTGTTGAGGACTTATCT
Neg-T3R00C7	CTTTTGTGCGTACTTTGACAGAATTACTTTAC
Neg-T3R02C7	GTTGAGCGTTGGCTTTTCAATTAAGCCCTACT
Neg-T3R04C7	AAATTTAGGTCAGAAGGGTATTTCAAACCATT
Neg-T3R06C7	CTTCTCAGCGTCTTAAAAATTCATTGACT
Neg-T3R08C7	GGTAATTGAAATGAATCATCTTCTTTTGCTCA
Neg-T3R10C7	ATGAATTGCCATCATCAATCAGGATTATATTG
Neg-T3R12C7	CTTCCTCAATTCCTTTAGATATTTTAGATAAC
Neg-T3R14C7	TTTAGGGCTATCAGTTTTTTAATGGCGATGT
Neg-T3R16C7	TTGAGCGTCAAAATGTAATCCATTTAGACGA
Neg-T3R18C7	AGAAGTATTGCTACAATGTTATTACTAATCAA
Neg-T3R20C7	GTCTAAATCCCTTTACTGGCGTACCGTTCCT
Neg-T4R00C7	GTCAAAGCAACCATAGCAGTTATACGTGCTC
Neg-T4R02C7	CTCCTTTGCTTTCTTAGCGCCCTAGCGCCCG
Neg-T4R04C7	GGTTCACGTAGTGGGCACTGATTTGGGTGAT
Neg-T4R06C7	TTTCGCCTGCTGGGGCCACCATCAAACAGGAT
Neg-T4R08C7	GCAACGCAATTAATGTAAGCGGGCAGTGAGC
Neg-T4R10C7	CCAACTTAATCGCCTTAAAACCCTGGCGTTAC
Neg-T4R12C7	TGACCTATCCCATTACCCCATCTACACCAACG
Neg-T4R14C7	TATTTGCTTATACAATACGTTTACAATTTAAA
Neg-T4R16C7	ATTAATTTATCAGCTAAGCTACCCTCTCCGGC
Neg-T4R18C7	TTATCCTTGGCTTGAAGGGTCTAAAAATTT
Neg-T4R20C7	ATTTGCTAATCTTTGAGGCTTTATTGCTTA

Table S5. Edge staples of the cover tile (CT) in G-G (Fig. 2A and fig. S1A).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGACGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTTTAAGTCTCCAATAAAGAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R06-2nt-G2	GAAGTCAATAGTGAATTTTAAAGACGCTGAGAAG
Edg-T3C7R08-2nt-G2	TATGAGCAAAAAGAAGATGATTCAATTTCAATTACC
Edg-T3C7R10-2nt-G2	CACAATATAATCCTGATTGATGATGGCAATTCAT
Edg-T3C7R12-2nt-G2	TGGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T3C7R14-2nt-G2	AGACATCGCCATTAAAAAAACTGATAGCCCTAAA
Edg-T3C7R16-2nt-G2	CCTCGTCTGAAATGGATTACATTTTGACGCTCAA
Edg-T3C7R18-2nt-G2	TCTTGATTAGTAATAACATTGTAGCAATACTTCT
Edg-T3C7R20-Q	AGGAACGGTACGCCAGTAAAGGGATTTTAGAC/3IAbrQSp/
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAAGCGAAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTGTTGGTGGCCCCAGCAGGCGAAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTAGAACCCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S6. Edge staples of the base tile (BT) in G-G (Fig. 2A and fig. S1A).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R00-F	/56-ROXN/AGCCACCACCCTCATTGAACCGCCACCCTCAG
Edg-T2C7R02-2nt-Rec	GAGAGGGTTGATATAAGCGGATAAGTGCCG
Edg-T2C7R04-2nt-Rec	GTATAAACAGTTAATGTTGAGTAACAGTGC
Edg-T2C7R06-2nt-Rec	GCAGGTCAGACGATTGTTGACAGGAGGTG
Edg-T2C7R08-2nt-Rec	TAGCGGTTTTTCATCGCTTTAGCGTCAGAC
Edg-T2C7R10-2nt-Rec	GCGCAAAGACAAAAGTTCATATGGTTTAC
Edg-T2C7R12-2nt-Rec	CCGAAGCCCTTTTTAAAGCAATAGCTATCT
Edg-T2C7R14-2nt-Rec	TTTTTTGTTTTAACGTCTCCAAATAAGAAAC
Edg-T2C7R16-2nt-Rec	AACCTCCCRACTTGCGGCGAGGCGTTTTAG
Edg-T2C7R18-2nt-Rec	TAAACCAAGTACCGCATTCCAAGAACGGGT
Edg-T2C7R20-2nt-Rec	AGATAAGTCCTGAACACCTGTTTATCAACA
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTTAAGACGCTGAGAAGGTGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAATAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCGAGGGTTTTAAGGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S7. Edge staples of the invader tile (Inv) in G-G (Fig. 2A and fig. S1A).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGACGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTTTAACGTCTCCAAATAAGAAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R00-2nt-G2	ATGTAAAGTAATTCTGTCAAAGTACCGACAAAAG
Edg-T3C7R02-2nt-G2	ATAGTAGGGCTTAATTGAAAAGCCAACGCTCAAC
Edg-T3C7R04-2nt-G2	CGAATGGTTTGAAATACCCTTCTGACCTAAATTT
Edg-T3C7R06-2nt-G2	GAAGTCAATAGTGAATTTTAAAGACGCTGAGAAG
Edg-T3C7R08-2nt-G2	TATGAGCAAAAAGAAGATGATTCATTTCAATTACC
Edg-T3C7R10-2nt-G2	CACAATATAATCCTGATTGATGATGGCAATTCAT
Edg-T3C7R12-2nt-G2	TGGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T3C7R14-2nt-G2	AGACATCGCCATTAATAAAAACTGATAGCCCTAAA
Edg-T3C7R16-2nt-G2	CCTCGTCTGAAATGGATTACATTTTGACGCTCAA
Edg-T3C7R18-2nt-G2	TCTTGATTAGTAATAACATTGTAGCAATACTTCT
Edg-T3C7R20	AGGAACGGTACGCCAGTAAAGGGATTTTAGAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCTTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S8. Edge staples of the cover tile (CT) in R-R (Fig. 2A and fig. S1B).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R00-F	/56-ROXN/AGCCACCACCCTCATTGAACCGCCACCCTCAG
Edg-T2C7R02-2nt-Rec	GAGAGGGTTGATATAAGCGGATAAGTGCCG
Edg-T2C7R04-2nt-Rec	GTATAAACAGTTAATGTTGAGTAACAGTGC
Edg-T2C7R06-2nt-Rec	GCAGGTCAGACGATTGTTGACAGGAGGTG
Edg-T2C7R08-2nt-Rec	TAGCGGTTTTTCATCGCTTAGCGTCAGAC
Edg-T2C7R10-2nt-Rec	GCGCAAAGACAAAAGTTCATATGGTTAC
Edg-T2C7R12-2nt-Rec	CCGAAGCCCTTTTTAAAGCAATAGCTATCT
Edg-T2C7R14-2nt-Rec	TTTTTTGTTTAAAGTCTCCAAATAAGAAAC
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTAAAGACGCTGAGAAGGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAAGCGAAAGGAGGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTGTTGGCCCCAGCAGGCGAAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGGCGATTAAGTTGGGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTAGAACCCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S9. Edge staples of the base tile (BT) in R-R (Fig. 2A and fig. S1B).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGACGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTTTAACGTCTCCAAATAAGAAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R00-2nt-G2	ATGTAAAGTAATTCTGTCAAAGTACCGACAAAAG
Edg-T3C7R02-2nt-G2	ATAGTAGGGCTTAATTGAAAAGCCAACGCTCAAC
Edg-T3C7R04-2nt-G2	CGAATGGTTTGAAATACCCTTCTGACCTAAATTT
Edg-T3C7R06-2nt-G2	GAAGTCAATAGTGAATTTTAAAGACGCTGAGAAG
Edg-T3C7R08-2nt-G2	TATGAGCAAAAAGAAGATGATTCATTTCAATTACC
Edg-T3C7R10-2nt-G2	CACAATATAATCCTGATTGATGATGGCAATTCAT
Edg-T3C7R12-2nt-G2	TGGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T3C7R14-2nt-G2	AGACATCGCCATTAATAAAAACTGATAGCCCTAAA
Edg-T3C7R16-2nt-G2	CCTCGTCTGAAATGGATTACATTTTGACGCTCAA
Edg-T3C7R18-2nt-G2	TCTTGATTAGTAATAACATTGTAGCAATACTTCT
Edg-T3C7R20-Q	AGGAACGGTACGCCAGTAAAGGGATTTTAGAC/3IAbRQSp/
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAAGCGAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAAGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCTTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S10. Edge staples of the invader tile (Inv) in R-R (Fig. 2A and fig. S1B).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R00	AGCCACCACCTCATTGAACCGCCACCCTCAG
Edg-T2C7R02-2nt-Rec	GAGAGGGTTGATATAAGCGGATAAGTGCCG
Edg-T2C7R04-2nt-Rec	GTATAAACAGTTAATGTTGAGTAACAGTGC
Edg-T2C7R06-2nt-Rec	GCAGGTCAGACGATTGTTGACAGGAGGTTG
Edg-T2C7R08-2nt-Rec	TAGCGGTTTTTCATCGCTTTAGCGTCAGAC
Edg-T2C7R10-2nt-Rec	GCGCAAAGACAAAAGTTCATATGGTTTAC
Edg-T2C7R12-2nt-Rec	CCGAAGCCCTTTTTAAAGCAATAGCTATCT
Edg-T2C7R14-2nt-Rec	TTTTTTGTTTAAACGTCTCCAAATAAGAAAC
Edg-T2C7R16-2nt-Rec	AACCTCCCRACTTGCGGCGAGGCGTTTTAG
Edg-T2C7R18-2nt-Rec	TAAACCAAGTACCGCATTCCAAGAACGGGT
Edg-T2C7R20-2nt-Rec	AGATAAGTCCGTGAACACCTGTTTATCAACA
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTTAAGACGCTGAGAAGGTGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCGAGGGTTTTAAGGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S11. Edge staples of the cover tile (CT) in G-R (Fig. 2A and fig. S1C).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R00-F	/56-ROXN/AGCCACCACCTCATTGAACCGCCACCCTCAG
Edg-T2C7R02-2nt-Rec	GAGAGGGTTGATATAAGCGGATAAGTGCCG
Edg-T2C7R04-2nt-Rec	GTATAAACAGTTAATGTTGAGTAACAGTGC
Edg-T2C7R06-2nt-Rec	GCAGGTCAGACGATTGTTGACAGGAGGTG
Edg-T2C7R08-2nt-Rec	TAGCGGTTTTTCATCGCTTAGCGTCAGAC
Edg-T2C7R10-2nt-Rec	GCGCAAAGACAAAAGTTCATATGGTTAC
Edg-T2C7R12-2nt-Rec	CCGAAGCCCTTTTTAAAGCAATAGCTATCT
Edg-T2C7R14-2nt-Rec	TTTTTTGTTTAAAGTCTCCAAATAAGAAAC
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTAAAGACGCTGAGAAGGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAAGCGAAAGGAGGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTGTTGGCCCCAGCAGGCGAAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGGCGATTAAGTTGGGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTAGAACCCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S12. Edge staples of the base tile (BT) in G-R (Fig. 2A and fig. S1C).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGCAGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTTTAACGTCTCCAAATAAGAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R00-2nt-Rec	GTAAAGTAATTCTGTCAAAGTACCGACAAA
Edg-T3C7R02-2nt-Rec	AGTAGGGCTTAATTGAAAAGCCAACGCTCA
Edg-T3C7R04-2nt-Rec	AATGGTTTGAAATACCCTTCTGACCTAAAT
Edg-T3C7R06-2nt-G2	GAAGTCAATAGTGAATTTTTAAGACGCTGAGAAG
Edg-T3C7R08-2nt-G2	TATGAGCAAAAAGAAGATGATTCATTTCAATTACC
Edg-T3C7R10-2nt-G2	CACAATATAATCCTGATTGATGATGGCAATTCAT
Edg-T3C7R12-2nt-G2	TGGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T3C7R14-2nt-G2	AGACATCGCCATTAAAAAAACTGATAGCCCTAAA
Edg-T3C7R16-2nt-G2	CCTCGTCTGAAATGGATTACATTTTGACGCTCAA
Edg-T3C7R18-2nt-G2	TCTTGATTAGTAATAACATTGTAGCAATACTTCT
Edg-T3C7R20-Q	AGGAACGGTACGCCAGTAAAGGGATTTTAGAC/3IAbRQSp/
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTAAAGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S13. Edge staples of the invader tile (Inv) in G-R (Fig. 2A and fig. S1C).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R00	AGCCACCACCCTCATTGAACCGCCACCCTCAG
Edg-T2C7R02-2nt-Rec	GAGAGGGTTGATATAAGCGGATAAGTGCCG
Edg-T2C7R04-2nt-Rec	GTATAAACAGTTAATGTTGAGTAACAGTGC
Edg-T2C7R06-2nt-Rec	GCAGGTCAGACGATTGTTGACAGGAGGTTG
Edg-T2C7R08-2nt-Rec	TAGCGGTTTTTCATCGCTTTAGCGTCAGAC
Edg-T2C7R10-2nt-Rec	GCGCAAAGACAAAAGTTCATATGGTTTAC
Edg-T2C7R12-2nt-Rec	CCGAAGCCCTTTTTAAAGCAATAGCTATCT
Edg-T2C7R14-2nt-Rec	TTTTTTGTTTAAACGTCTCCAAATAAGAAAC
Edg-T2C7R16-2nt-G3	TTAACCTCCCGACTTGCGGCGAGGCGTTTTAGCG
Edg-T2C7R18-2nt-G3	ACTAAACCAAGTACCGCATTCCAAGAACGGGTAT
Edg-T2C7R20-2nt-G3	AGAGATAAGTCCTGAACACCTGTTTATCAACAAT
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTTAAGACGCTGAGAAGGTGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAATAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCGAGGGTTTTAAGGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S14. Edge staples of the cover tile (CT) in R-G (Fig. 2A and fig. S1D).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGACGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTTTAAGTCTCCAATAAAGAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R06-2nt-G2	GAAGTCAATAGTGAATTTTAAAGACGCTGAGAAG
Edg-T3C7R08-2nt-G2	TATGAGCAAAAAGAAGATGATTCATTTCAATTACC
Edg-T3C7R10-2nt-G2	CACAATATAATCCTGATTGATGATGGCAATTCAT
Edg-T3C7R12-2nt-G2	TGGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T3C7R14-2nt-G2	AGACATCGCCATTAAAAAAACTGATAGCCCTAAA
Edg-T3C7R16-2nt-G2	CCTCGTCTGAAATGGATTACATTTTGACGCTCAA
Edg-T3C7R18-2nt-G2	TCTTGATTAGTAATAACATTGTAGCAATACTTCT
Edg-T3C7R20-Q	AGGAACGGTACGCCAGTAAAGGGATTTTAGAC/3IAbRQSp/
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAAGCGAAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTGTTGGTGGCCCCAGCAGGCGAAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTAGAACCCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S15. Edge staples of the base tile (BT) in R-G (Fig. 2A and fig. S1D).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R00-F	/56-ROXN/AGCCACCACCTCATTGAACCGCCACCCTCAG
Edg-T2C7R02-2nt-Rec	GAGAGGGTTGATATAAGCGGATAAGTGCCG
Edg-T2C7R04-2nt-Rec	GTATAAACAGTTAATGTTGAGTAACAGTGC
Edg-T2C7R06-2nt-Rec	GCAGGTCAGACGATTGTTGACAGGAGGTG
Edg-T2C7R08-2nt-Rec	TAGCGGTTTTTCATCGCTTTAGCGTCAGAC
Edg-T2C7R10-2nt-Rec	GCGCAAAGACAAAAGTTCATATGGTTTAC
Edg-T2C7R12-2nt-Rec	CCGAAGCCCTTTTTAAAGCAATAGCTATCT
Edg-T2C7R14-2nt-Rec	TTTTTTGTTTAAACGTCTCCAAATAAGAAAC
Edg-T2C7R16-2nt-G3	TTAACCTCCCGACTTGCGGCGAGGCGTTTTAGCG
Edg-T2C7R18-2nt-G3	ACTAAACCAAGTACCGCATTCCAAGAACGGGTAT
Edg-T2C7R20-2nt-G3	AGAGATAAGTCCTGAACACCTGTTTATCAACAAT
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTAAAGACGCTGAGAAGGTGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCGAGGGTTTTAAGGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S16. Edge staples of the invader tile (Inv) in R-G (Fig. 2A and fig. S1D).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGCAGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTTTAACGTCTCCAAATAAGAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R00-2nt-Rec	GTAAAGTAATTCTGTCAAAGTACCGACAAA
Edg-T3C7R02-2nt-Rec	AGTAGGGCTTAATTGAAAAGCCAACGCTCA
Edg-T3C7R04-2nt-Rec	AATGGTTTGAAATACCCTTCTGACCTAAAT
Edg-T3C7R06-2nt-G2	GAAGTCAATAGTGAATTTTTAAGACGCTGAGAAG
Edg-T3C7R08-2nt-G2	TATGAGCAAAAAGAAGATGATTCATTTCAATTACC
Edg-T3C7R10-2nt-G2	CACAATATAATCCTGATTGATGATGGCAATTCAT
Edg-T3C7R12-2nt-G2	TGGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T3C7R14-2nt-G2	AGACATCGCCATTAAAAAAACTGATAGCCCTAAA
Edg-T3C7R16-2nt-G2	CCTCGTCTGAAATGGATTACATTTTGACGCTCAA
Edg-T3C7R18-2nt-G2	TCTTGATTAGTAATAACATTGTAGCAATACTTCT
Edg-T3C7R20	AGGAACGGTACGCCAGTAAAGGGATTTTAGAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTAAAGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTTGTAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S17. Edge staples of the cover tile (CT) with a discontinuous toehold (Fig. 2C and fig. S2B).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGACGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTTTAACGTCTCCAATAAGAAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R02-2nt-G2	ATAGTAGGGCTTAATTGAAAAGCCAACGCTCAAC
Edg-T3C7R04-2nt-G2	CGAATGGTTTGAAATACCCTTCTGACCTAAATTT
Edg-T3C7R08-2nt-G2	TATGAGCAAAAAGAAGATGATTCAATTTCAATTACC
Edg-T3C7R10-2nt-G2	CACAATATAATCCTGATTGATGATGGCAATTCAT
Edg-T3C7R12-2nt-G2	TGGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T3C7R16-2nt-G2	CCTCGTCTGAAATGGATTACATTTTGACGCTCAA
Edg-T3C7R18-2nt-G2	TCTTGATTAGTAATAACATTGTAGCAATACTTCT
Edg-T3C7R20-Q	AGGAACGGTACGCCAGTAAAGGGATTTTAGAC/3IAbRQSp/
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAAGCGAAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTGTTGGTGGCCCCAGCAGGCGAAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S18. Edge staples of the cover tile (CT) in E4G4 (Fig. 2E and fig. S3B).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAGACAGCATCGGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGACGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTTTAACGTCTCAAATAAGAAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTTAAGACGCTGAGAAGGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R06-2nt-G4	TAATCCTGTTTGTGTTGGCCCCAGCAGGCGAAA
Edg-T4C7R08-2nt-G4	CAGCTCACTGCCCGCTTACATTAATTGCGTTGC
Edg-T4C7R10-2nt-G4	GGGTAACGCCAGGGTTTTAAGGCGATTAAGTTGG
Edg-T4C7R12-2nt-G4	GCCGTTGGTGTAGATGGGGTAATGGGATAGGTCA
Edg-T4C7R14-2nt-G4	AATTTAAATTGTAAACGTATTGTATAAGCAAATA
Edg-T4C7R16-2nt-G4	CCGCCGAGAGGGTAGCTTAGCTGATAAATTAAT
Edg-T4C7R18-2nt-G4	AGAAATTTTTAGAACCCTTTCAACGCAAGGATAA
Edg-T4C7R20-Q	TAAGCAATAAAGCCTCAAAGAATTAGCAAAAT/3IAbRQSp/

Table S19. Edge staples of the base tile (BT) in E4G4 (Fig. 2E and fig. S3B).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGCAGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTTTAACGTCTCCAAATAAGAAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTTAAGACGCTGAGAAGGTGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R00-F	/5TYE563/GAGCACGTATAACGTGCTATGGTTGCTTTGAC
Edg-T4C7R02-2nt-Rec	CGGGCGCTAGGGCGCTAAGAAAGCGAAAGG
Edg-T4C7R04-2nt-Rec	ATCACCCAAATCAAGTGCCCACTACGTGAA
Edg-T4C7R06-2nt-Rec	ATCCTGTTTGATGGTGGCCCCAGCAGGCGA
Edg-T4C7R08-2nt-Rec	GCTCACTGCCCGCTTTACATTAATTGCGTT
Edg-T4C7R10-2nt-Rec	GTAACGCCAGGGTTTTAAGGCGATTAAGTT
Edg-T4C7R12-2nt-Rec	CGTTGGTGTAGATGGGGTAATGGGATAGGT
Edg-T4C7R14-2nt-Rec	TTTAAATTGTAAACGTATTGTATAAGCAAA
Edg-T4C7R16-2nt-Rec	GCCGGAGAGGGTAGCTTAGCTGATAAATTA
Edg-T4C7R18-2nt-Rec	AAATTTTTAGAACCCTTTCAACGCAAGGAT
Edg-T4C7R20-2nt-Rec	TAAGCAATAAAGCCTCAAAGAATTAGCAAA

Table S20. Edge staples of the invader tile (Inv) in E4G4 (Fig. 2E and fig. S3B).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGACAGGTCAGACGATTGTTGACAGGAGGTTGAGTGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTTTAACGTCTCCAAATAAGAAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTTAAGACGCTGAGAAGGTGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R00-2nt-G4	ATGAGCACGTATAACGTGCTATGGTTGCTTTGAC
Edg-T4C7R02-2nt-G4	AACGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAG
Edg-T4C7R04-2nt-G4	ATATCACCCAAATCAAGTGCCCACTACGTGAACC
Edg-T4C7R06-2nt-G4	TAATCCTGTTTGATGGTGGCCCCAGCAGGCGAAA
Edg-T4C7R08-2nt-G4	CAGCTCACTGCCCGCTTTACATTAATTGCGTTGC
Edg-T4C7R10-2nt-G4	GGGTAACGCCAGGGTTTTAAGGCGATTAAGTTGG
Edg-T4C7R12-2nt-G4	GCCGTTGGTGTAGATGGGGTAATGGGATAGGTCA
Edg-T4C7R14-2nt-G4	AATTTAAATGTAAACGTATTGTATAAGCAAATA
Edg-T4C7R16-2nt-G4	CCGCCGAGAGGGTAGCTTAGCTGATAAATTAAT
Edg-T4C7R18-2nt-G4	AGAAATTTTAGAACCCTTCAACGCAAGGATAA
Edg-T4C7R20	TAAGCAATAAAGCCTCAAAGAATTAGCAAAAT

Table S21. Edge staples of tile S0 in design1 of the sword assembly (Fig. 3A and fig. S5A).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R00-2nt-Rec	AGCCACCACCCTCATTGAACCGCCACCCTC
Edg-T2C7R02-2nt-Rec	GAGAGGGTTGATATAAGCGGATAAGTGCCG
Edg-T2C7R04-2nt-Rec	GTATAAACAGTTAATGTTGAGTAACAGTGC
Edg-T2C7R06-2nt-Rec	GCAGGTCAGACGATTGTTGACAGGAGGTTG
Edg-T2C7R08-2nt-Rec	TAGCGGTTTTTCATCGCTTAGCGTCAGAC
Edg-T2C7R10-2nt-Rec	GCGCAAAGACAAAAGTTTCATATGGTTTAC
Edg-T2C7R12-2nt-Rec	CCGAAGCCCTTTTTAAAGCAATAGCTATCT
Edg-T2C7R14-2nt-Rec	TTTTTTGTTTAAACGTCTCCAATAAGAAAC
Edg-T2C7R16-2nt-Rec	AACCTCCCAGCTTGCGGCGAGGCGTTTTAG
Edg-T2C7R18-2nt-Rec	TAAACCAAGTACCGCATTCCAAGAACGGGT
Edg-T2C7R20-F	/56-ROXN/AGATAAGTCCTGAACACCTGTTTATCAACAAT
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTTAAGACGCTGAGAAGGTGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R00-2nt-Rec	GAGCAGGTATAACGTGCTATGGTTGCTTTG
Edg-T4C7R02-2nt-Rec	CGGGCGCTAGGGCGCTAAGAAAGCGAAAAGG
Edg-T4C7R04-2nt-Rec	ATCACCCAAATCAAGTGCCCACTACGTGAA
Edg-T4C7R06-2nt-Rec	ATCCTGTTTGATGGTGGCCCCAGCAGGCGA
Edg-T4C7R08-2nt-Rec	GCTCACTGCCCGCTTTACATTAATTGCGTT
Edg-T4C7R10-2nt-Rec	GTAACGCCAGGGTTTTAAGGCGATTAAGTT
Edg-T4C7R12-2nt-Rec	CGTTGGTGTAGATGGGGTAATGGGATAGGT
Edg-T4C7R14-2nt-Rec	TTTAAATTGTAAACGTATTGTATAAGCAAA
Edg-T4C7R16-2nt-Rec	GCCGAGAGGGTAGCTTAGCTGATAAATTA
Edg-T4C7R18-2nt-Rec	AAATTTTTAGAACCCTTTTCAACGCAAGGAT
Edg-T4C7R20-Q	TAAGCAATAAAGCCTCAAAGAATTAGCAAAAT/3IAbrQSp/

Table S22. Edge staples of tile S1 in design1 of the sword assembly (Fig. 3A and fig. S5A).

Name	Sequence
Edg-T1C7R00-2nt-G1	GTGGTGGCATCAATTCTAGGGCGCGAGCTGAAAA
Edg-T1C7R02-2nt-G1	ATCCCAATTCTGCGAACCCATATAACAGTTGAT
Edg-T1C7R04-2nt-G1	TCATTGCTCCTTTTGATATTAGAGAGTACCTTTA
Edg-T1C7R06-2nt-G1	CGCCATAAATCAAAAATCCAGAAAACGAGAATGA
Edg-T1C7R08-2nt-G1	GCCGAGGCATAGTAAGAGACGCCAAAAGGAATTA
Edg-T1C7R10-2nt-G1	GAGAAACACCAGAACGAGAGGCTTGCCCTGACGA
Edg-T1C7R12-2nt-G1	TACTGATAAATTGTGTGCGAGATTTGTATCATCGC
Edg-T1C7R14-2nt-G1	GAGAACGAGGGTAGCAACGCGAAAAGACAGCATCG
Edg-T1C7R16-2nt-G1	TAGGTTTATCAGCTTGCTAGCCTTTAATTGTATC
Edg-T1C7R18-2nt-G1	ATGGGATTTTGCTAAACAAATGAATTTTCTGTAT
Edg-T1C7R20-2nt-G1	AAACAAACTACAACGCCTGAGTTTCGTACCAGT
Edg-T2C7R00-2nt-G1	GTAGCCACCACCCTCATTGAACGCCACCCTCAG
Edg-T2C7R02-2nt-G1	ATGAGAGGGTTGATATAAGCGGATAAGTGCCGTC
Edg-T2C7R04-2nt-G1	TCGTATAAACAGTTAATGTTGAGTAACAGTGCCC
Edg-T2C7R06-2nt-G1	CGGCAGGTCAGACGATTGTTGACAGGAGGTTGAG
Edg-T2C7R08-2nt-G1	GCTAGCGGTTTTTCATCGCTTTAGCGTCAGACTG
Edg-T2C7R10-2nt-G1	GAGCGCAAAGACAAAAGTTCATATGTTTACCA
Edg-T2C7R12-2nt-G1	TACCGAAGCCCTTTTTAAAGCAATAGCTATCTTA
Edg-T2C7R14-2nt-G1	GATTTTTTGTTTAACGTCTCCAAATAAGAAACGA
Edg-T2C7R16-2nt-G1	TAAACCTCCCAGCTTGCGGCGAGGCGTTTTAGCG
Edg-T2C7R18-2nt-G1	ATTAACCAAGTACCGCATTCCAAGAACGGGTAT
Edg-T2C7R20-2nt-G1	AAAGATAAGTCTGAACACCTGTTTATCAACAAT
Edg-T3C7R00-2nt-G1	GTGTAAAGTAATTCTGTCAAAGTACCGACAAAAG
Edg-T3C7R02-2nt-G1	ATAGTAGGGCTTAATTGAAAAGCCAACGCTCAAC
Edg-T3C7R04-2nt-G1	TCAATGGTTTGAAATACCCTTCTGACCTAAATTT
Edg-T3C7R06-2nt-G1	CGAGTCAATAGTGAATTTTTAAGACGCTGAGAAG
Edg-T3C7R08-2nt-G1	GCTGAGCAAAAGAAGATGATTCAATTTCAATTACC
Edg-T3C7R10-2nt-G1	GACAATATAATCCTGATTGATGATGGCAATTCAT
Edg-T3C7R12-2nt-G1	TAGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T3C7R14-2nt-G1	GAACATCGCCATTAAAAAACTGATAGCCCTAAA
Edg-T3C7R16-2nt-G1	TATCGTCTGAAATGGATTACATTTTGACGCTCAA
Edg-T3C7R18-2nt-G1	ATTTGATTAGTAATAACATTGTAGCAATACTTCT
Edg-T3C7R20-2nt-G1	AAAGGAACGGTACGCCAGTAAAGGGATTTTAGAC
Edg-T4C7R00-F	/5TYE563/GAGCACGTATAACGTGCTATGGTTGCTTTGAC
Edg-T4C7R02-2nt-G4	AACGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAG
Edg-T4C7R04-2nt-G4	ATATCACCCAAATCAAGTGCCCACTACGTGAACC
Edg-T4C7R06-2nt-G4	TAATCCTGTTTGATGGTGGCCCCAGCAGGCGAAA
Edg-T4C7R08-2nt-G4	CAGCTCACTGCCGCTTTACATTAATTGCGTTGC
Edg-T4C7R10-2nt-G4	GGGTAACGCCAGGGTTTTAAGGCGATTAAGTTGG
Edg-T4C7R12-2nt-G4	GCCGTTGGTGTAGATGGGGTAATGGGATAGGTCA

Table S23. Edge staples of tile S2 in design1 of the sword assembly (Fig. 3A and fig. S5A).

Name	Sequence
Edg-T1C7R00-2nt-G1	GTGGTGGCATCAATTCTAGGGCGCGAGCTGAAAA
Edg-T1C7R02-2nt-G1	ATTCCCAATTCTGCGAACCCATATAACAGTTGAT
Edg-T1C7R04-2nt-G1	TCATTGCTCCTTTTGTATATTAGAGAGTACCTTTA
Edg-T1C7R06-2nt-G1	CGCCATAAATCAAAAATCCAGAAAACGAGAATGA
Edg-T1C7R08-2nt-G1	GCCGAGGCATAGTAAGAGACGCCAAAAGGAATTA
Edg-T1C7R10-2nt-G1	GAGAAACACCAGAACGAGAGGCTTGCCCTGACGA
Edg-T1C7R12-2nt-G1	TACTGATAAATTGTGTCGAGATTTGTATCATCGC
Edg-T1C7R14-2nt-G1	GAGAACGAGGGTAGCAACGCGAAAGACAGCATCG
Edg-T1C7R16-2nt-G1	TAGGTTTATCAGCTTGCTAGCCTTTAATTGTATC
Edg-T1C7R18-2nt-G1	ATGGGATTTTGCTAAACAAATGAATTTTCTGTAT
Edg-T1C7R20-2nt-G1	AAACAAACTACAACGCCTGAGTTTCGTCAACAGT
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGCAGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTTGTTTAAAGTCTCCAAATAAGAAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R00-Q	GTAAAGTAATTCTGTCAAAGTACCGACAAAAG/3IabrQSp/
Edg-T3C7R02-2nt-G2	ATAGTAGGGCTTAATTGAAAAGCCAACGCTCAAC
Edg-T3C7R04-2nt-G2	CGAATGGTTTGAAATACCCTTCTGACCTAAATTT
Edg-T3C7R06-2nt-G2	GAAGTCAATAGTGAATTTTTAAGACGCTGAGAAG
Edg-T3C7R08-2nt-G2	TATGAGCAAAAAGAAGATGATTCAATTCAATTACC
Edg-T3C7R10-2nt-G2	CACAATATAATCCTGATTGATGATGGCAATTCAT
Edg-T3C7R12-2nt-G2	TGGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAAGCGAAAGGAGGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTGTTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGGCGATTAAGTTGGGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S24. Edge staples of tile S3 in design1 of the sword assembly (Fig. 3A and fig. S5A).

Name	Sequence
Edg-T1C7R00-Rec	GGTGGCATCAATTCTAGGGCGGAGCTGAA
Edg-T1C7R02-Rec	TCCCAATTCTGCGAACCCATATAACAGTTG
Edg-T1C7R04-Rec	ATTGCTCCTTTTGTATATTAGAGAGTACCTT
Edg-T1C7R06-Rec	CCATAAATCAAAAATCCAGAAAACGAGAAT
Edg-T1C7R08-Rec	CGAGGCATAGTAAGAGACGCCAAAAGGAAT
Edg-T1C7R10-Rec	GAAACACCAGAACGAGAGGCTTGCCCTGAC
Edg-T1C7R12-Rec	CTGATAAATTGTGTCGAGATTTGTATCATC
Edg-T1C7R14-Rec	GAACGAGGGTAGCAACGCGAAAAGACAGCAT
Edg-T1C7R16-Rec	GGTTTATCAGCTTGCTAGCCTTTAATTGTA
Edg-T1C7R18-Rec	GGGATTTTGCTAAACAATGAATTTTCTGT
Edg-T1C7R20-Rec	ACAAACTACAACGCCTGAGTTTCGTACCA
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGAGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTTTAACGCTCCTCAAATAAGAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTAAAGACGCTGAGAAGGTGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAATAAAGGCTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S25. Edge staples of tile S0 in design2 of the sword assembly (Fig. 3C and fig. S5B).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R00-F	/56-ROXN/AGCCACCACCTCATTGAACCGCCACCCTCAG
Edg-T2C7R02-2nt-Rec	GAGAGGGTTGATATAAGCGGATAAGTGCCG
Edg-T2C7R04-2nt-Rec	GTATAAACAGTTAATGTTGAGTAACAGTGC
Edg-T2C7R06-2nt-Rec	GCAGGTCAGACGATTGTTGACAGGAGGTTG
Edg-T2C7R08-2nt-Rec	TAGCGGTTTTTCATCGCTTAGCGTCAGAC
Edg-T2C7R10-2nt-Rec	GCGCAAAGACAAAAGTTTCATATGGTTTAC
Edg-T2C7R12-2nt-Rec	CCGAAGCCCTTTTTAAAGCAATAGCTATCT
Edg-T2C7R14-2nt-Rec	TTTTTTGTTTAAACGTCTCCAAATAAGAAAC
Edg-T2C7R16-2nt-Rec	AACCTCCCAGCTTGCGGGGAGGCGTTTTAG
Edg-T2C7R18-2nt-Rec	TAAACCAAGTACCGCATTCCAAGAACGGGT
Edg-T2C7R20-2nt-Rec	AGATAAGTCTGAACACCTGTTTATCAACA
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTTAAGACGCTGAGAAGGTGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAAGTATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R00-F	/5TYE563/GAGCACGTATAACGTGCTATGGTTGCTTTGAC
Edg-T4C7R02-2nt-Rec	CGGGCGCTAGGGCGCTAAGAAAGCGAAAGG
Edg-T4C7R04-2nt-Rec	ATCACCCAAATCAAGTGCCCACTACGTGAA
Edg-T4C7R06-2nt-Rec	ATCCTGTTTGATGGTGGCCCCAGCAGGCGA
Edg-T4C7R08-2nt-Rec	GCTCACTGCCCGCTTTACATTAATTGCGTT
Edg-T4C7R10-2nt-Rec	GTAACGCCAGGGTTTTAAGGCGATTAAGTT
Edg-T4C7R12-2nt-Rec	CGTTGGTGTAGATGGGGTAATGGGATAGGT
Edg-T4C7R14-2nt-Rec	TTTAAATTGTAAACGTATTGTATAAGCAAA
Edg-T4C7R16-2nt-Rec	GCCGGAGAGGGTAGCTTAGCTGATAAATTA
Edg-T4C7R18-2nt-Rec	AAATTTTTAGAACCTTTCAACGCAAGGAT
Edg-T4C7R20-2nt-Rec	TAAGCAATAAAGCCTCAAAGAATTAGCAAA

Table S26. Edge staples of tile S1 in design2 of the sword assembly (Fig. 3C and fig. S5B).

Name	Sequence
Edg-T1C7R00-2nt-G3	ACGGTGGCATCAATTCTAGGGCGGAGCTGAAAA
Edg-T1C7R02-2nt-G3	CTTCCCAATTCTGCGAACCCATATAACAGTTGAT
Edg-T1C7R04-2nt-G3	AAATTGCTCCTTTTGTATATTAGAGAGTACCTTTA
Edg-T1C7R06-2nt-G3	AACCATAAATCAAAAATCCAGAAAACGAGAATGA
Edg-T1C7R08-2nt-G3	AGCGAGGCATAGTAAGAGACGCCAAAAGGAATTA
Edg-T1C7R10-2nt-G3	ATGAAACACCAGAACGAGAGGCTTGCCCTGACGA
Edg-T1C7R12-2nt-G3	CCCTGATAAAATTGTGTGAGATTTGTATCATCGC
Edg-T1C7R14-2nt-G3	AGGAACGAGGGTAGCAAACGCGAAAGACAGCATCG
Edg-T1C7R16-2nt-G3	TTGGTTTATCAGCTTGCTAGCCTTTAATTGTATC
Edg-T1C7R18-2nt-G3	ACGGGATTTTGCTAAACAAATGAATTTTCTGTAT
Edg-T1C7R20-2nt-G3	AGACAAACTACAACGCCTGAGTTTCGTACCAGT
Edg-T2C7R00-2nt-G3	ACAGCCACCACCCTCATTGAACGCCACCCTCAG
Edg-T2C7R02-2nt-G3	CTGAGAGGGTTGATATAAGCGGATAAGTGCCGTC
Edg-T2C7R04-2nt-G3	AAGTATAAACAGTTAATGTTGAGTAACAGTGCCC
Edg-T2C7R06-2nt-G3	AAGCAGGTCAGACGATTGTTGACAGGAGGTTGAG
Edg-T2C7R08-2nt-G3	AGTAGCGGTTTTTCATCGCTTTAGCGTCAGACTG
Edg-T2C7R10-2nt-G3	ATGCGCCAAAGACAAAAGTTCATATGGTTTACCA
Edg-T2C7R12-2nt-G3	CCCCGAAGCCCTTTTTAAAGCAATAGCTATCTTA
Edg-T2C7R14-2nt-G3	AGTTTTTTGTTTAAACGTCTCCAAATAAGAAACGA
Edg-T2C7R16-2nt-G3	TTAACCTCCCAGACTTGCGGCGAGGCGTTTTAGCG
Edg-T2C7R18-2nt-G3	ACTAAACCAAGTACCGCATTCCAAGAACGGGTAT
Edg-T2C7R20-2nt-G3	AGAGATAAGTCTGAACACCTGTTTATCAACAAT
Edg-T3C7R08-2nt-G4	CATGAGCAAAAAGAAGATGATTCATTCAATTACC
Edg-T3C7R10-2nt-G4	GGCAATATAATCCTGATTGATGATGGCAATTCAT
Edg-T3C7R12-2nt-G4	GCGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T3C7R14-2nt-G4	AAACATCGCCATTAAAAAACTGATAGCCCTAAA
Edg-T3C7R16-2nt-G4	CCTCGTCTGAAATGGATTACATTTTGACGCTCAA
Edg-T3C7R18-2nt-G4	AGTTGATTAGTAATAACATTGTAGCAATACTTCT
Edg-T3C7R20-Q	AGGAACGGTACGCCAGTAAAGGGATTTTAGAC/3IAbRQSp/
Edg-T4C7R00-2nt-G3	ACGAGCACGTATAACGTGCTATGGTTGCTTTGAC
Edg-T4C7R02-2nt-G3	CTCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAG
Edg-T4C7R04-2nt-G3	AAATCACCCAAATCAAGTGCCACTACGTGAACC
Edg-T4C7R06-2nt-G3	AAATCCTGTTTGATGGTGGCCCCAGCAGGCGAAA
Edg-T4C7R08-2nt-G3	AGGCTCACTGCCCGTTTACATTAATTGCGTTGC
Edg-T4C7R10-2nt-G3	ATGTAACGCCAGGTTTTAAGGCGATTAAGTTGG
Edg-T4C7R12-2nt-G3	CCCGTTGGTGTAGATGGGGTAATGGGATAGGTCA
Edg-T4C7R14-2nt-G3	AGTTTAAATTGTAACGTATTGTATAAGCAAATA
Edg-T4C7R16-2nt-G3	TTGCCGAGAGGGTAGCTTAGCTGATAAAATTAAT
Edg-T4C7R18-2nt-G3	ACAAATTTTTAGAACCCTTTCAACGCAAGGATAA
Edg-T4C7R20-2nt-G3	AGTAAGCAATAAAGCCTCAAAGAATTAGCAAAAT

Table S27. Edge staples of tile S2 in design2 of the sword assembly (Fig. 3C and fig. S5B).

Name	Sequence
Edg-T1C7R00-2nt-G3	ACGGTGGCATCAATTCTAGGGCGCGAGCTGAAAA
Edg-T1C7R02-2nt-G3	CTTCCCAATTCTGCGAACCCATATAACAGTTGAT
Edg-T1C7R04-2nt-G3	AAATTGCTCCTTTTGTATATTAGAGAGTACCTTTA
Edg-T1C7R06-2nt-G3	AACCATAAATCAAAAATCCAGAAAACGAGAATGA
Edg-T1C7R08-2nt-G3	AGCGAGGCATAGTAAGAGACGCCAAAAGGAATTA
Edg-T1C7R10-2nt-G3	ATGAAACACCAGAACGAGAGGCTTGCCCTGACGA
Edg-T1C7R12-2nt-G3	CCCTGATAAATTGTGTCGAGATTTGTATCATCGC
Edg-T1C7R14-2nt-G3	AGGAACGAGGGTAGCAACGCGAAAGACAGCATCG
Edg-T1C7R16-2nt-G3	TTGGTTTATCAGCTTGCTAGCCTTTAATTGTATC
Edg-T1C7R18-2nt-G3	ACGGGATTTTGCTAAACAAATGAATTTTCTGTAT
Edg-T1C7R20-2nt-G3	AGACAAACTACAACGCTGAGTTTCGTCAACAGT
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGCAGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTTGTTTAAAGTCTCCAAATAAGAAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R08-2nt-G2	TATGAGCAAAGAAGATGATTTCATTTCAATTACC
Edg-T3C7R10-2nt-G2	CACAATATAATCCTGATTGATGATGGCAATTCAT
Edg-T3C7R12-2nt-G2	TGGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T3C7R14-2nt-G2	AGACATCGCCATTAAAAAAACTGATAGCCCTAAA
Edg-T3C7R16-2nt-G2	CCTCGTCTGAAATGGATTACATTTTGACGCTCAA
Edg-T3C7R18-2nt-G2	TCTTGATTAGTAATAACATTGTAGCAATACTTCT
Edg-T3C7R20-Q	AGGAACGGTACGCCAGTAAAGGGATTTTAGAC/3IAbRQSp/
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTGTTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGGCGATTAAGTTGGGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S28. Edge staples of tile S3 in design2 of the sword assembly (Fig. 3C and fig. S5B).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAACGAGGGTAGCAACGCGAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGTCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGAGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTAAACGTCCTCAAATAAAGAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R00-Rec	GTAAGTAATTCTGTCAAAGTACCGACAAA
Edg-T3C7R02-Rec	AGTAGGGCTTAATTGAAAAGCCAACGCTCA
Edg-T3C7R04-Rec	AATGGTTTGAATACCCTTCTGACCTAAAT
Edg-T3C7R06-Rec	AGTCAATAGTGAATTTTAAAGACGCTGAGA
Edg-T3C7R08-Rec	TGAGCAAAGAAGATGATTCATTTCAATTA
Edg-T3C7R10-Rec	CAATATAATCCTGATTGATGATGGCAATTC
Edg-T3C7R12-Rec	GTTATCTAAAATATCTAAAGGAATTGAGGA
Edg-T3C7R14-Rec	ACATCGCCATTAAAAAAAGTATAGCCCTA
Edg-T3C7R16-Rec	TCGTCTGAAATGGATTACATTTTGACGCTC
Edg-T3C7R18-Rec	TTGATTAGTAATAACATTGTAGCAATACTT
Edg-T3C7R20-Rec	AGGAACGGTACGCCAGTAAAGGGATTTTAG
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTAAATTTGTAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S29. Edge staples of tile H1 in design1 of the head invader (Fig. 4A and fig. S6A).

Name	Sequence
Edg-T1C7R00-2nt-G4	ATGGTGGCATCAATTCTAGGGCGCGAGCTGAAAA
Edg-T1C7R02-2nt-G4	AATCCCAATTCTGCGAACCCATATAACAGTTGAT
Edg-T1C7R04-2nt-G4	ATATTGCTCCTTTTGTATATTAGAGAGTACCTTTA
Edg-T1C7R06-2nt-G4	TACCATAAAATCAAAAATCCAGAAAACGAGAATGA
Edg-T1C7R08-2nt-G4	CACGAGGCATAGTAAGAGACGCCAAAAGGAATTA
Edg-T1C7R10-2nt-G4	GGGAAACACCAGAACGAGAGGCTTGCCCTGACGA
Edg-T1C7R12-2nt-G4	GCCTGATAAAATTGTGTGCGAGATTTGTATCATCGC
Edg-T1C7R14-2nt-G4	AAGAACGAGGGTAGCAACGCGAAAGACAGCATCG
Edg-T1C7R16-2nt-G4	CCGGTTTATCAGCTTGCTAGCCTTTAATTGTATC
Edg-T1C7R18-2nt-G4	AGGGGATTTTGCTAAACAAATGAATTTTCTGTAT
Edg-T1C7R20-2nt-G4	ACACAAACTACAACGCTGAGTTTCGTACCCAGT
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGCGAGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTAAAGTCTCCAAATAAGAAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R00-2nt-G1	GTGTAAAGTAATTCTGTCAAAGTACCGACAAAAG
Edg-T3C7R02-2nt-G1	ATAGTAGGGCTTAATTGAAAAGCCAACGCTCAAC
Edg-T3C7R04-2nt-G1	TCAATGGTTTGAATACCCCTTCTGACCTAAATTT
Edg-T3C7R06-2nt-G1	CGAGTCAATAGTGAATTTTTAAGACGCTGAGAAG
Edg-T3C7R08-2nt-G1	GCTGAGCAAAAAGAAGATGATTCAATTCAATTACC
Edg-T3C7R10-2nt-G1	GACAATATAATCCTGATTGATGATGGCAATTCAT
Edg-T3C7R12-2nt-G1	TAGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T3C7R14-2nt-G1	GAACATCGCCATTAAAAAAAGTATAGCCCTAAA
Edg-T3C7R16-2nt-G1	TATCGTCTGAAATGGATTACATTTTGACGCTCAA
Edg-T3C7R18-2nt-G1	ATTTGATTAGTAATAACATTGTAGCAATACTTCT
Edg-T3C7R20-2nt-G1	AAAGGAACGGTACGCCAGTAAAGGGATTTTAGAC
Edg-T4C7R00-2nt-G2	ATGAGCACGTATAACGTGCTATGGTTGCTTTGAC
Edg-T4C7R02-2nt-G2	ATCGGGCGTAGGGCGCTAAGAAAAGCGAAAGGAG
Edg-T4C7R04-2nt-G2	CGATCACCCAAATCAAGTGCCCACTACGTGAACC
Edg-T4C7R06-2nt-G2	GAATCCTGTTTGTGTTGGCCCCAGCAGGCGAAA
Edg-T4C7R08-2nt-G2	TAGCTCACTGCCCGCTTACATTAATTGCGTTGC
Edg-T4C7R10-2nt-G2	CAGTAACGCCAGGGTTTTAAGGGGATTAAGTTGG
Edg-T4C7R12-2nt-G2	TGCGTTGGTGTAGATGGGGTAATGGGATAGGTCA
Edg-T4C7R14-2nt-G2	AGTTTAAATTGTAACCGTATTGTATAAGCAAATA
Edg-T4C7R16-2nt-G2	CCGCCGGAGAGGGTAGCTTAGCTGATAAATTAAT
Edg-T4C7R18-2nt-G2	TCAAATTTTTAGAACCCTTTCAACGCAAGGATAA
Edg-T4C7R20-2nt-G2	AGTAAGCAATAAAGCCTCAAAGAATTAGCAAAAT

Table S30. Edge staples of tile H2 in design1 of the head invader (Fig. 4A and fig. S6A).

Name	Sequence
Edg-T1C7R00-2nt-Rec	GGTGGCATCAATTCTAGGGCGCGAGCTGAA
Edg-T1C7R02-2nt-Rec	TCCCAATTCTGCGAACCCATATAACAGTTG
Edg-T1C7R04-2nt-Rec	ATTGCTCCTTTTGATATTAGAGAGTACCTT
Edg-T1C7R06-2nt-Rec	CCATAAATCAAAAATCCAGAAAACGAGAAT
Edg-T1C7R08-2nt-Rec	CGAGGCATAGTAAGAGACGCCAAAAGGAAT
Edg-T1C7R10-2nt-Rec	GAAACACCAGAACGAGAGGCTTGCCCTGAC
Edg-T1C7R12-2nt-Rec	CTGATAAATTGTGTCGAGATTTGTATCATC
Edg-T1C7R14-2nt-Rec	GAACGAGGGTAGCAACGCCGAAAGACAGCAT
Edg-T1C7R16-2nt-Rec	GGTTTATCAGCTTGCTAGCCTTTAATTGTA
Edg-T1C7R18-2nt-Rec	GGGATTTTGCTAAACAAATGAATTTTCTGT
Edg-T1C7R20-2nt-Rec	ACAAACTACAACGCCTGAGTTTCGTACCA
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGCAGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCCAAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTTTAACGCTCTCAAATAAGAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTAAAGACGCTGAGAAGGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAAGTATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R00-2nt-Rec	GAGCAGGTATAACGTGCTATGGTTGCTTTG
Edg-T4C7R02-2nt-Rec	CGGGCGCTAGGGCGCTAAGAAAGCGAAAGG
Edg-T4C7R04-2nt-Rec	ATCACCCAAATCAAGTGCCCACTACGTGAA
Edg-T4C7R06-2nt-Rec	ATCCTGTTTGTGGTGGCCCCAGCAGGCGA
Edg-T4C7R08-2nt-Rec	GCTCACTGCCCGCTTTACATTAATTGCGTT
Edg-T4C7R10-2nt-Rec	GTAACGCCAGGGTTTTAAGGCGATTAAGTT
Edg-T4C7R12-2nt-Rec	CGTTGGTGTAGATGGGGTAATGGGATAGGT
Edg-T4C7R14-2nt-Rec	TTTAAATTGTAAACGTATTGTATAAGCAAA
Edg-T4C7R16-2nt-Rec	GCCGGAGAGGGTAGCTTAGCTGATAAATTA
Edg-T4C7R18-2nt-Rec	AAATTTTATAGAACCTTTCAACGCAAGGAT
Edg-T4C7R20-2nt-Rec	TAAGCAATAAAGCCTCAAAGAATTAGCAAA

Table S31. Edge staples of tile H3 in design1 of the head invader (Fig. 4A and fig. S6A).

Name	Sequence
Edg-T1C7R00-2nt-G3	ACGGTGGCATCAATTCTAGGGCGCGAGCTGAAAA
Edg-T1C7R02-2nt-G3	CTTCCCAATTCTGCGAACCCATATAACAGTTGAT
Edg-T1C7R04-2nt-G3	AAATTGCTCCTTTTGTATATTAGAGAGTACCTTTA
Edg-T1C7R06-2nt-G3	AACCATAAATCAAAAATCCAGAAAACGAGAATGA
Edg-T1C7R08-2nt-G3	AGCGAGGCATAGTAAGAGACGCCAAAAGGAATTA
Edg-T1C7R10-2nt-G3	ATGAAACACCAGAACGAGAGGCTTGCCCTGACGA
Edg-T1C7R12-2nt-G3	CCCTGATAAATTGTGTCGAGATTTGTATCATCGC
Edg-T1C7R14-2nt-G3	AGGAACGAGGGTAGCAACGCGAAAGACAGCATCG
Edg-T1C7R16-2nt-G3	TTGGTTTATCAGCTTGCTAGCCTTTAATTGTATC
Edg-T1C7R18-2nt-G3	ACGGGATTTTGCTAAACAAATGAATTTTCTGTAT
Edg-T1C7R20-2nt-G3	AGACAAACTACAACGCCTGAGTTTCGTCAACAGT
Edg-T2C7R00-2nt-G4	ATAGCCACCACCCTCATTGAACGCCACCCTCAG
Edg-T2C7R02-2nt-G4	AAGAGAGGGTTGATATAAGCGGATAAGTGCCGTC
Edg-T2C7R04-2nt-G4	ATGTATAAACAGTTAATGTTGAGTAACAGTGCCC
Edg-T2C7R06-2nt-G4	TAGCAGGTCAGACGATTGTTGACAGGAGGTTGAG
Edg-T2C7R08-2nt-G4	CATAGCGGTTTTTCATCGCTTTAGCGTCGACTG
Edg-T2C7R10-2nt-G4	GGGCGCAAAGACAAAAGTTCATATGGTTTACCA
Edg-T2C7R12-2nt-G4	GCCCGAAGCCCTTTTTAAAGCAATAGCTATCTTA
Edg-T2C7R14-2nt-G4	AATTTTTTGTTTAACGTCTCAAATAAGAAACGA
Edg-T2C7R16-2nt-G4	CCAACCTCCCGACTTGCGGCGAGGCGTTTTAGCG
Edg-T2C7R18-2nt-G4	AGTAAACCAAGTACCGCATTCCAAGAACGGGTAT
Edg-T2C7R20-2nt-G4	ACAGATAAGTCCTGAACACCTGTTTATCAACAAT
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTTAAGACGCTGAGAAGGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGTTTTAAGGCGATTAAGTTGGGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S32. Edge staples of tile H4 in design1 of the head invader (Fig. 4A and fig. S6A).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R00-2nt-Rec	AGCCACCACCCCTATTGAACCGCCACCCTC
Edg-T2C7R02-2nt-Rec	GAGAGGGTTGATATAAGCGGATAAGTGCCG
Edg-T2C7R04-2nt-Rec	GTATAAACAGTTAATGTTGAGTAACAGTGC
Edg-T2C7R06-2nt-Rec	GCAGGTCAGACGATTGTTGACAGGAGGTG
Edg-T2C7R08-2nt-Rec	TAGCGGTTTTTCATCGCTTAGCGTCAGAC
Edg-T2C7R10-2nt-Rec	GCGCAAAGACAAAAGTTCATATGGTTTAC
Edg-T2C7R12-2nt-Rec	CCGAAGCCCTTTTTAAAGCAATAGCTATCT
Edg-T2C7R14-2nt-Rec	TTTTTTGTTTAAACGTCTCCAATAAGAAAC
Edg-T2C7R16-2nt-Rec	AACCTCCCAGCTTGCGGCGAGGCGTTTTAG
Edg-T2C7R18-2nt-Rec	TAAACCAAGTACCGCATTCCAAGAACGGGT
Edg-T2C7R20-2nt-Rec	AGATAAGTCCTGAACACCTGTTTATCAACA
Edg-T3C7R00-2nt-Rec	GTAAAGTAATTCTGTCAAAGTACCGACAAA
Edg-T3C7R02-2nt-Rec	AGTAGGGCTTAATTGAAAAGCCAACGCTCA
Edg-T3C7R04-2nt-Rec	AATGGTTTGAAATACCCTTCTGACCTAAAT
Edg-T3C7R06-2nt-Rec	AGTCAATAGTGAATTTTTAAGACGCTGAGA
Edg-T3C7R08-2nt-Rec	TGAGCAAAAAGAAGATGATTCATTTCAATTA
Edg-T3C7R10-2nt-Rec	CAATATAATCCTGATTGATGATGGCAATTC
Edg-T3C7R12-2nt-Rec	GTTATCTAAAAATATCTAAAGGAATTGAGGA
Edg-T3C7R14-2nt-Rec	ACATCGCCATTAAAAAAACTGATAGCCCTA
Edg-T3C7R16-2nt-Rec	TCGTCTGAAATGGATTACATTTTGACGCTC
Edg-T3C7R18-2nt-Rec	TTGATTAGTAATAACATTGTAGCAATACTT
Edg-T3C7R20-2nt-Rec	AGGAACGGTACGCCAGTAAAGGGATTTTAG
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGTAGGGCGCTAAGAAAGCGAAAGGAGGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGGCGATTAAGTTGGGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTGAACCCTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S33. Edge staples of tile H1 in design2 of the head invader (Fig. 4C and fig. S6B).

Name	Sequence
Edg-T1C7R00-2nt-G4	ATGGTGGCATCAATTCTAGGGCGCGAGCTGAAAA
Edg-T1C7R02-2nt-G4	AATCCCAATTCTGCGAACCCATATAACAGTTGAT
Edg-T1C7R04-2nt-G4	ATATTGCTCCTTTTGTATATTAGAGAGTACCTTA
Edg-T1C7R06-2nt-G4	TACCATAAAATCAAAAATCCAGAAAACGAGAATGA
Edg-T1C7R08-2nt-G4	CACGAGGCATAGTAAGAGACGCCAAAAGGAATTA
Edg-T1C7R10-2nt-G4	GGGAAACACCAGAACGAGAGGCTTGCCCTGACGA
Edg-T1C7R12-2nt-G4	GCCTGATAAATTGTGTCGAGATTTGTATCATCGC
Edg-T1C7R14-2nt-G4	AAGAACGAGGGTAGCAACGCGAAAGACAGCATCG
Edg-T1C7R16-2nt-G4	CCGGTTTATCAGCTTGCTAGCCTTTAATTGTATC
Edg-T1C7R18-2nt-G4	AGGGGATTTTGCTAAACAAATGAATTTTCTGTAT
Edg-T1C7R20-2nt-G4	ACACAAACTACAACGCCTGAGTTTCGTACCCAGT
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGCGAGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTAAACGTCTCCAAATAAGAAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R02-2nt-G1	ATAGTAGGGCTTAATTGAAAAGCCAACGCTCAAC
Edg-T3C7R04-2nt-G1	TCAATGGTTTGAAATACCCCTTCTGACCTAAATTT
Edg-T3C7R06-2nt-G1	CGAGTCAATAGTGAATTTTTAAGACGCTGAGAAG
Edg-T3C7R08-2nt-G1	GCTGAGCAAAAAGAAGATGATTCAATTTCAATTACC
Edg-T3C7R12-2nt-G1	TAGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T3C7R14-2nt-G1	GAACATCGCCATTAAAAAAACTGATAGCCCTAAA
Edg-T3C7R16-2nt-G1	TATCGTCTGAAATGGATTACATTTTGACGCTCAA
Edg-T3C7R18-2nt-G1	ATTTGATTAGTAATAACATTGTAGCAATACTTCT
Edg-T4C7R02-2nt-G2	ATCGGGCGCTAGGGCGCTAAGAAAAGCGAAAAGGAG
Edg-T4C7R04-2nt-G2	CGATCACCCAAATCAAGTGCCCACTACGTGAACC
Edg-T4C7R06-2nt-G2	GAATCCTGTTTGATGGTGCCCAAGCAGGCGAAA
Edg-T4C7R08-2nt-G2	TAGCTCACTGCCCGCTTACATTAATTGCGTTGC
Edg-T4C7R12-2nt-G2	TGCGTTGGTGTAGATGGGTAATGGGATAGGTCA
Edg-T4C7R14-2nt-G2	AGTTTAAATGTAAACGTATTGTATAAGCAAATA
Edg-T4C7R16-2nt-G2	CCGCCGAGAGGGTAGCTTAGCTGATAAATTAAT
Edg-T4C7R18-2nt-G2	TCAAATTTTLAGAACCTTTCAACGCAAGGATAA

Table S34. Edge staples of tile H2 in design2 of the head invader (Fig. 4C and fig. S6B).

Name	Sequence
Edg-T1C7R02-2nt-Rec	TCCCAATTCTGCGAACCCATATAACAGTTG
Edg-T1C7R04-2nt-Rec	ATTGCTCCTTTTGATATTAGAGAGTACCTT
Edg-T1C7R06-2nt-Rec	CCATAAATCAAAAATCCAGAAAACGAGAAT
Edg-T1C7R08-2nt-Rec	CGAGGCATAGTAAGAGACGCCAAAAGGAAT
Edg-T1C7R12-2nt-Rec	CTGATAAATTGTGTCGAGATTTGTATCATC
Edg-T1C7R14-2nt-Rec	GAACGAGGGTAGCAACGCCGAAAGACAGCAT
Edg-T1C7R16-2nt-Rec	GGTTTATCAGCTTGCTAGCCTTTAATTGTA
Edg-T1C7R18-2nt-Rec	GGGATTTTGCTAAACAAATGAATTTTCTGT
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGCGAGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTTGTTTAAACGTCTCCAAATAAGAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTAAAGACGCTGAGAAGGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R02-2nt-Rec	CGGGCGCTAGGGCGCTAAGAAAAGCGAAAGG
Edg-T4C7R04-2nt-Rec	ATCACCCAAATCAAGTGCCCACTACGTGAA
Edg-T4C7R06-2nt-Rec	ATCCTGTTTGATGGTGGCCCCAGCAGGCGA
Edg-T4C7R08-2nt-Rec	GCTCACTGCCCGCTTTACATTAATTGCGTT
Edg-T4C7R12-2nt-Rec	CGTTGGTGTAGATGGGGTAATGGGATAGGT
Edg-T4C7R14-2nt-Rec	TTTAAATTGTAAACGTATTGTATAAGCAAA
Edg-T4C7R16-2nt-Rec	GCCGGAGAGGGTAGCTTAGCTGATAAATTA
Edg-T4C7R18-2nt-Rec	AAATTTTTAGAACCCTTTCAACGCAAGGAT

Table S35. Edge staples of tile H3 in design2 of the head invader (Fig. 4C and fig. S6B).

Name	Sequence
Edg-T1C7R02-2nt-G3	CTTCCCAATTCTGCGAACCCATATAACAGTTGAT
Edg-T1C7R04-2nt-G3	AAATTGCTCCTTTTGTATTAGAGAGTACCTTTA
Edg-T1C7R06-2nt-G3	AACCATAAAATCAAAAAATCCAGAAAAAGAGAATGA
Edg-T1C7R08-2nt-G3	AGCGAGGCATAGTAAGAGACGCCAAAAGGAATTA
Edg-T1C7R12-2nt-G3	CCCTGATAAAATTGTGTGCGAGATTTGTATCATCGC
Edg-T1C7R14-2nt-G3	AGGAACGAGGGTAGCAACGCGAAAGACAGCATCG
Edg-T1C7R16-2nt-G3	TTGGTTTATCAGCTTGCTAGCCTTTAATTGTATC
Edg-T1C7R18-2nt-G3	ACGGGATTTTGCTAAACAAATGAATTTTCTGTAT
Edg-T2C7R02-2nt-G4	AAGAGAGGGTTGATATAAGCGGATAAGTGCCGTC
Edg-T2C7R04-2nt-G4	ATGTATAAACAGTTAATGTTGAGTAACAGTGCC
Edg-T2C7R06-2nt-G4	TAGCAGGTCAGACGATTGTTGACAGGAGTTGAG
Edg-T2C7R08-2nt-G4	CATAGCGCGTTTTTCATCGCTTTAGCGTCAGACTG
Edg-T2C7R12-2nt-G4	GCCCGAAGCCCTTTTTAAAGCAATAGCTATCTTA
Edg-T2C7R14-2nt-G4	AATTTTTTGTTTAACGTCTCCAAATAAGAAACGA
Edg-T2C7R16-2nt-G4	CCAACCTCCCGACTTGCGGCGAGGCGTTTTAGCG
Edg-T2C7R18-2nt-G4	AGTAAACCAAGTACCGCATTCCAAGAACGGGTAT
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTTAAGACGCTGAGAAGGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACATCGCCATTAATAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGCGGATTAAGTTGGGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S36. Edge staples of tile H4 in design2 of the head invader (Fig. 4C and fig. S6B).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R02-2nt-Rec	GAGAGGGTTGATATAAGCGGATAAGTGCCG
Edg-T2C7R04-2nt-Rec	GTATAAACAGTTAATGTTGAGTAACAGTGC
Edg-T2C7R06-2nt-Rec	GCAGGTCAGACGATTGTTGACAGGAGGTTG
Edg-T2C7R08-2nt-Rec	TAGCGGTTTTTCATCGCTTTAGCGTCAGAC
Edg-T2C7R12-2nt-Rec	CCGAAGCCCTTTTTAAAGCAATAGCTATCT
Edg-T2C7R14-2nt-Rec	TTTTTTGTTTAAAGTCTCCAAATAAGAAAC
Edg-T2C7R16-2nt-Rec	AACCTCCCAGACTTGCGGCGAGGCGTTTTAG
Edg-T2C7R18-2nt-Rec	TAAACCAAGTACCGCATTCCAAGAACGGGT
Edg-T3C7R02-2nt-Rec	AGTAGGGCTTAATTGAAAAGCCAACGCTCA
Edg-T3C7R04-2nt-Rec	AATGGTTTGAAATACCCTTCTGACCTAAAT
Edg-T3C7R06-2nt-Rec	AGTCAATAGTGAATTTTTAAGACGCTGAGA
Edg-T3C7R08-2nt-Rec	TGAGCAAAAGAAGATGATTCATTTCAATTA
Edg-T3C7R12-2nt-Rec	GTTATCTAAAATATCTAAAGGAATTGAGGA
Edg-T3C7R14-2nt-Rec	ACATCGCCATTAAAAAAACTGATAGCCCTA
Edg-T3C7R16-2nt-Rec	TCGTCTGAAATGGATTACATTTTGACGCTC
Edg-T3C7R18-2nt-Rec	TTGATTAGTAATAACATTGTAGCAATACTT
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCGAGGGTTTTAAGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S37. Edge staples of tile *a* in design1 of the tail invader (Fig. 5A and fig. S8A).

Name	Sequence
Edg-T1C7R00-2nt-G1	GTGGTGGCATCAATTCTAGGGCGCGAGCTGAAAA
Edg-T1C7R02-2nt-G1	ATTCCCAATTCTGCGAACCCATATAACAGTTGAT
Edg-T1C7R04-2nt-G1	TCATTGCTCCTTTTGTATATTAGAGAGTACCTTA
Edg-T1C7R06-2nt-G1	CGCCATAAATCAAAAATCCAGAAAACGAGAATGA
Edg-T1C7R08-2nt-G1	GCCGAGGCATAGTAAGAGACGCCAAAAGGAATTA
Edg-T1C7R10-2nt-G1	GAGAAACACCAGAACGAGAGGCTTGCCCTGACGA
Edg-T1C7R12-2nt-G1	TACTGATAAATTGTGTCGAGATTTGTATCATCGC
Edg-T1C7R14-2nt-G1	GAGAACGAGGGTAGCAACGCGAAAGACAGCATCG
Edg-T1C7R16-2nt-G1	TAGGTTTATCAGCTTGCTAGCCTTTAATTGTATC
Edg-T1C7R18-2nt-G1	ATGGGATTTTGCTAAACAAATGAATTTTCTGTAT
Edg-T1C7R20-2nt-G1	AAACAAACTACAACGCCTGAGTTTCGTACCAGT
Edg-T2C7R00-2nt-G2	ATAGCCACCACCCTCATTGAACGCCACCCTCAG
Edg-T2C7R02-2nt-G2	ATGAGAGGGTTGATATAAGCGGATAAGTGCCGTC
Edg-T2C7R04-2nt-G2	CGGTATAAACAGTTAATGTTGAGTAACAGTGCCC
Edg-T2C7R06-2nt-G2	GAGCAGGTCAGACGATTGTTGACAGGAGGTTGAG
Edg-T2C7R08-2nt-G2	TATAGCGGTTTTTCATCGCTTTAGCGTCAGACTG
Edg-T2C7R10-2nt-G2	CAGCGCAAAGACAAAAGTTCATATGGTTTACCA
Edg-T2C7R12-2nt-G2	TGCCGAAGCCCTTTTTAAAGCAATAGCTATCTTA
Edg-T2C7R14-2nt-G2	AGTTTTTTGTTTAAACGTCTCCAAATAAGAAACGA
Edg-T2C7R16-2nt-G2	CCAACCTCCCGACTTGCGGCGAGGCGTTTTAGCG
Edg-T2C7R18-2nt-G2	TCTAAACCAAGTACCGCATTCCAAGAACGGGTAT
Edg-T2C7R20-2nt-G2	AGAGATAAGTCCTGAACACCTGTTTATCAACAAT
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTTAAGACGCTGAGAAGGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGTTTTAAGGCGATTAAGTTGGGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAATTGTAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S38. Edge staples of tile *b* in design1 of the tail invader (Fig. 5A and fig. S8A).

Name	Sequence
Edg-T1C7R00-2nt-Rec	GGTGGCATCAATTCTAGGGCGCGAGCTGAA
Edg-T1C7R02-2nt-Rec	TCCCAATTCTGCGAACCCATATAACAGTTG
Edg-T1C7R04-2nt-Rec	ATTGCTCCTTTTGATATTAGAGAGTACCTT
Edg-T1C7R06-2nt-Rec	CCATAAATCAAAAATCCAGAAAACGAGAAT
Edg-T1C7R08-2nt-Rec	CGAGGCATAGTAAGAGACGCCAAAAGGAAT
Edg-T1C7R10-2nt-Rec	GAAACACCAGAACGAGAGGCTTGCCCTGAC
Edg-T1C7R12-2nt-Rec	CTGATAAATTGTGTCGAGATTTGTATCATC
Edg-T1C7R14-2nt-Rec	GAACGAGGGTAGCAACGCCGAAAGACAGCAT
Edg-T1C7R16-2nt-Rec	GGTTTATCAGCTTGCTAGCCTTTAATTGTA
Edg-T1C7R18-2nt-Rec	GGGATTTTGCTAAACAAATGAATTTTCTGT
Edg-T1C7R20-2nt-Rec	ACAAACTACAACGCCTGAGTTTCGTACCA
Edg-T2C7R00-2nt-Rec	AGCCACCACCCTCATTGAACCGCCACCCTC
Edg-T2C7R02-2nt-Rec	GAGAGGGTTGATATAAGCGGATAAGTGCCG
Edg-T2C7R04-2nt-Rec	GTATAAACAGTTAATGTTGAGTAACAGTGC
Edg-T2C7R06-2nt-Rec	GCAGGTCAGACGATTGTTGACAGGAGGTTG
Edg-T2C7R08-2nt-Rec	TAGCGGTTTTTCATCGCTTTAGCGTCAGAC
Edg-T2C7R10-2nt-Rec	GCGCAAAGACAAAAGTTCATATGGTTTAC
Edg-T2C7R12-2nt-Rec	CCGAAGCCCTTTTTAAAGCAATAGCTATCT
Edg-T2C7R14-2nt-Rec	TTTTTTGTTTAAACGTCTCCAAATAAGAAAC
Edg-T2C7R16-2nt-Rec	AACCTCCCGACTTGCGGCGAGGCGTTTTAG
Edg-T2C7R18-2nt-Rec	TAAACCAAGTACCGCATTCCAAGAACGGGT
Edg-T2C7R20-2nt-Rec	AGATAAGTCCTGAACACCTGTTTATCAACA
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTTAAGACGCTGAGAAGGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGGCGATTAAGTTGGGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTTGTAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCCTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S39. Edge staples of tile *c* in design1 of the tail invader (Fig. 5A and fig. S8A).

Name	Sequence
Edg-T1C7R00-2nt-Rec	GGTGGCATCAATTCTAGGGCGCGAGCTGAA
Edg-T1C7R02-2nt-Rec	TCCCAATTCTGCGAACCCATATAACAGTTG
Edg-T1C7R04-2nt-Rec	ATTGCTCCTTTTGATATTAGAGAGTACCTT
Edg-T1C7R06-2nt-Rec	CCATAAATCAAAAATCCAGAAAACGAGAAT
Edg-T1C7R08-2nt-Rec	CGAGGCATAGTAAGAGACGCCAAAAGGAAT
Edg-T1C7R10-2nt-Rec	GAAACACCAGAACGAGAGGCTTGCCCTGAC
Edg-T1C7R12-2nt-Rec	CTGATAAATTGTGTCGAGATTTGTATCATC
Edg-T1C7R14-2nt-Rec	GAACGAGGGTAGCAACGCCGAAAGACAGCAT
Edg-T1C7R16-2nt-Rec	GGTTTATCAGCTTGCTAGCCTTTAATTGTA
Edg-T1C7R18-2nt-Rec	GGGATTTTGCTAAACAAATGAATTTTCTGT
Edg-T1C7R20-2nt-Rec	ACAAACTACAACGCCTGAGTTTCGTACCA
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGCAGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTTTAACGCTCTCAAATAAGAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTAAAGACGCTGAGAAGGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCGAGGGTTTTAAGGCGATTAAGTTGGGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S40. Edge staples of tile *a* in design2 of the tail invader (fig. S8B).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R00-2nt-G1	GTAGCCACCACCCTCATTGAACCGCCACCCTCAG
Edg-T2C7R02-2nt-G1	ATGAGAGGGTTGATATAAGCGGATAAGTGCCGTC
Edg-T2C7R04-2nt-G1	TCGTATAAACAGTTAATGTTGAGTAACAGTGCCC
Edg-T2C7R06-2nt-G1	CGGCAGGTCAGACGATTGTTGACAGGAGGTTGAG
Edg-T2C7R08-2nt-G1	GCTAGCGCGTTTTTCATCGCTTTAGCGTCAGACTG
Edg-T2C7R10-2nt-G1	GAGCGCCAAAGACAAAAGTTCATATGGTTTACCA
Edg-T2C7R12-2nt-G1	TACCGAAGCCCTTTTTAAAGCAATAGCTATCTTA
Edg-T2C7R14-2nt-G1	GATTTTTTGTTTAACGTCTCCAAATAAGAAACGA
Edg-T2C7R16-2nt-G1	TAAACCTCCCGACTTGCGGCGAGGCGTTTTAGCG
Edg-T2C7R18-2nt-G1	ATTAAACCAAGTACCGCATTCCAAGAACGGGTAT
Edg-T2C7R20-2nt-G1	AAAGATAAGTCCTGAACACCTGTTTATCAACAAT
Edg-T3C7R00-2nt-G2	ATGTAAAGTAATTCTGTCAAAGTACCGACAAAAG
Edg-T3C7R02-2nt-G2	ATAGTAGGGCTTAATTGAAAAGCCAACGCTCAAC
Edg-T3C7R04-2nt-G2	CGAATGGTTTGAATACCCTTCTGACCTAAATTT
Edg-T3C7R06-2nt-G2	GAAGTCAATAGTGAATTTTTAAGACGCTGAGAAG
Edg-T3C7R08-2nt-G2	TATGAGCAAAAAGAAGATGATTCATTCAATTACC
Edg-T3C7R10-2nt-G2	CACAATATAATCCTGATTGATGATGGCAATTCAT
Edg-T3C7R12-2nt-G2	TGGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T3C7R14-2nt-G2	AGACATCGCCATTAAAAAAAGTATAGCCCTAAA
Edg-T3C7R16-2nt-G2	CCTCGTCTGAAATGGATTACATTTTGACGCTCAA
Edg-T3C7R18-2nt-G2	TCTTGATTAGTAATAACATTGTAGCAATACTTCT
Edg-T3C7R20	AGGAACGGTACGCCAGTAAAGGGATTTTAGAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S41. Edge staples of tile *b* in design2 of the tail invader (fig. S8B).

Name	Sequence
Edg-T1C7R00-2nt-Rec	GGTGGCATCAATTCTAGGGCGCGAGCTGAA
Edg-T1C7R02-2nt-Rec	TCCCAATTCTGCGAACCCATATAACAGTTG
Edg-T1C7R04-2nt-Rec	ATTGCTCCTTTTGATATTAGAGAGTACCTT
Edg-T1C7R06-2nt-Rec	CCATAAATCAAAAATCCAGAAAACGAGAAT
Edg-T1C7R08-2nt-Rec	CGAGGCATAGTAAGAGACGCCAAAAGGAAT
Edg-T1C7R10-2nt-Rec	GAAACACCAGAACGAGAGGCTTGCCCTGAC
Edg-T1C7R12-2nt-Rec	CTGATAAATTGTGTCGAGATTTGTATCATC
Edg-T1C7R14-2nt-Rec	GAACGAGGGTAGCAACGCCGAAAGACAGCAT
Edg-T1C7R16-2nt-Rec	GGTTTATCAGCTTGCTAGCCTTTAATTGTA
Edg-T1C7R18-2nt-Rec	GGGATTTTGCTAAACAAATGAATTTTCTGT
Edg-T1C7R20-2nt-Rec	ACAAACTACAACGCCTGAGTTTCGTACCA
Edg-T2C7R00-2nt-Rec	AGCCACCACCCTCATTGAACCGCCACCCTC
Edg-T2C7R02-2nt-Rec	GAGAGGGTTGATATAAGCGGATAAGTGCCG
Edg-T2C7R04-2nt-Rec	GTATAAACAGTTAATGTTGAGTAACAGTGC
Edg-T2C7R06-2nt-Rec	GCAGGTCAGACGATTGTTGACAGGAGGTTG
Edg-T2C7R08-2nt-Rec	TAGCGGTTTTTCATCGCTTTAGCGTCAGAC
Edg-T2C7R10-2nt-Rec	GCGCAAAGACAAAAGTTTCATATGGTTTAC
Edg-T2C7R12-2nt-Rec	CCGAAGCCCTTTTTAAAGCAATAGCTATCT
Edg-T2C7R14-2nt-Rec	TTTTTTGTTTAAACGTCTCCAAATAAGAAAC
Edg-T2C7R16-2nt-Rec	AACCTCCCAGCTTGCGGCGAGGCGTTTTAG
Edg-T2C7R18-2nt-Rec	TAAACCAAGTACCGCATTCCAAGAACGGGT
Edg-T2C7R20-2nt-Rec	AGATAAGTCCTGAACACCTGTTTATCAACA
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTTAAGACGCTGAGAAGGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAACTGATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGGCGATTAAGTTGGGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTTGTAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCCTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S42. Edge staples of tile *c* in design2 of the tail invader (fig. S8B).

Name	Sequence
Edg-T1C7R00-2nt-Rec	GGTGGCATCAATTCTAGGGCGCGAGCTGAA
Edg-T1C7R02-2nt-Rec	TCCCAATTCTGCGAACCCATATAACAGTTG
Edg-T1C7R04-2nt-Rec	ATTGCTCCTTTTGATATTAGAGAGTACCTT
Edg-T1C7R06-2nt-Rec	CCATAAATCAAAAATCCAGAAAACGAGAAT
Edg-T1C7R08-2nt-Rec	CGAGGCATAGTAAGAGACGCCAAAAGGAAT
Edg-T1C7R10-2nt-Rec	GAAACACCAGAACGAGAGGCTTGCCCTGAC
Edg-T1C7R12-2nt-Rec	CTGATAAATTGTGTCGAGATTTGTATCATC
Edg-T1C7R14-2nt-Rec	GAACGAGGGTAGCAACGCCGAAAGACAGCAT
Edg-T1C7R16-2nt-Rec	GGTTTATCAGCTTGCTAGCCTTTAATTGTA
Edg-T1C7R18-2nt-Rec	GGGATTTTGCTAAACAAATGAATTTTCTGT
Edg-T1C7R20-2nt-Rec	ACAAACTACAACGCCTGAGTTTCGTACCA
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGCAGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTTTAACGCTCTCAAATAAGAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R02-DHP	GTGTCGTAGACACAGTAGGGCTTAATTGAAAAGCCAACGCTCAACGTGTCGTAGACAC
Edg-T3C7R06-DHP	GTGTCGTAGACACAGTCAATAGTGAATTTTAAGACGCTGAGAAGGTGTCGTAGACAC
Edg-T3C7R10-DHP	GTGTCGTAGACACCAATATAATCCTGATTGATGATGGCAATTCATGTGTCGTAGACAC
Edg-T3C7R14-DHP	GTGTCGTAGACACACATCGCCATTAAAAAAAGTATAGCCCTAAAGTGTGTCGTAGACAC
Edg-T3C7R18-DHP	GTGTCGTAGACACTTGATTAGTAATAACATTGTAGCAATACTTCTGTGTCGTAGACAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGGCGATTAAGTTGGGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCCTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S43. Edge staples of tile *a* in the reconfiguration of barrels to polymers (Fig. 7A and fig. S9).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R00-2nt-G3	ACAGCCACCACCCTCATTGAACCGCCACCCTCAG
Edg-T2C7R02-2nt-G3	CTGAGAGGGTTGATATAAGCGGATAAGTGCCGTC
Edg-T2C7R04-2nt-G3	AAGTATAAACAGTTAATGTTGAGTAACAGTGCCC
Edg-T2C7R06-2nt-G3	AAGCAGGTCAGACGATTGTTGACAGGAGGTTGAG
Edg-T2C7R08-2nt-G3	AGTAGCGCGTTTTTCATCGCTTTTAGCGTCAGACTG
Edg-T2C7R10-2nt-G3	ATGCGCCAAAGACAAAAGTTCATATGGTTTTACCA
Edg-T2C7R12-2nt-G3	CCCCGAAGCCCTTTTTTAAAGCAATAGCTATCTTA
Edg-T2C7R14-2nt-G3	AGTTTTTTGTTTTAACGTCTCCAAATAAGAAACGA
Edg-T2C7R16-2nt-G3	TTAACCTCCCGACTTGCGGCGAGGCGTTTTAGCG
Edg-T2C7R18-2nt-G3	ACTAAACCAAGTACCGCATTCCAAGAACGGGTAT
Edg-T2C7R20-2nt-G3	AGAGATAAGTCCTGAACACCTGTTTATCAACAAT
Edg-T3C7R08-2nt-G4	CATGAGCAAAAAGAAGATGATTTCATTTCAATTACC
Edg-T3C7R10-2nt-G4	GGCAATATAATCCTGATTGATGATGGCAATTCAT
Edg-T3C7R12-2nt-G4	GCGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T3C7R14-2nt-G4	AAACATCGCCATTAAAAAACTGATAGCCCTAAA
Edg-T3C7R16-2nt-G4	CCTCGTCTGAAATGGATTACATTTTGACGCTCAA
Edg-T3C7R18-2nt-G4	AGTTGATTAGTAATAACATTGTAGCAATACTTCT
Edg-T3C7R20-Q	AGGAACGGTACGCCAGTAAAGGGATTTTAGAC/3IAbRQSp/
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTGTTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGGCGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCTTTTCAACGCAAGGATAAGTGTGTCGTAGACAC

Table S44. Edge staples of tile *b* in the reconfiguration of barrels to polymers (Fig. 7A and fig. S9).

Name	Sequence
Edg-T3C7R00-2nt-Rec	GTAAAGTAATTCTGTCAAAGTACCGACAAA
Edg-T3C7R02-2nt-Rec	AGTAGGGCTTAATTGAAAAGCCAACGCTCA
Edg-T3C7R04-2nt-Rec	AATGGTTTGAAATACCCCTTCTGACCTAAAT
Edg-T3C7R06-2nt-Rec	AGTCAATAGTGAATTTTAAAGACGCTGAGA
Edg-T3C7R08-2nt-Rec	TGAGCAAAAGAAGATGATTCAATTCAATTA
Edg-T3C7R10-2nt-Rec	CAATATAATCCTGATTGATGATGGCAATTC
Edg-T3C7R12-2nt-Rec	GTTATCTAAAATATCTAAAGGAATTGAGGA
Edg-T3C7R14-2nt-Rec	ACATCGCCATTAAAAAAACTGATAGCCCTA
Edg-T3C7R16-2nt-Rec	TCGTCTGAAATGGATTACATTTTGACGCTC
Edg-T3C7R18-2nt-Rec	TTGATTAGTAATAACATTGTAGCAATACTT
Edg-T3C7R20-2nt-Rec	AGGAACGGTACGCCAGTAAAGGATTTTAG
Edg-T4C7R00-F	/5TYE563/GAGCACGTATAACGTGCTATGGTTGCTTTGAC
Edg-T4C7R02-2nt-Rec	CGGGCGCTAGGGCGCTAAGAAAGCGAAAGG
Edg-T4C7R04-2nt-Rec	ATCACCCAAATCAAGTGCCCACTACGTGAA
Edg-T4C7R06-2nt-Rec	ATCCTGTTTGTATGGTGGCCCCAGCAGGCGA
Edg-T4C7R08-2nt-Rec	GCTCACTGCCCCTTTACATTAATTGCGTT
Edg-T4C7R10-2nt-Rec	GTAACGCCAGGGTTTAAAGGCGATTAAGTT
Edg-T4C7R12-2nt-Rec	CGTTGGTGTAGATGGGGTAATGGGATAGGT
Edg-T4C7R14-2nt-Rec	TTTAAATTGTAAACGTATTGTATAAGCAAA
Edg-T4C7R16-2nt-Rec	GCCGGAGAGGGTAGCTTAGCTGATAAATTA
Edg-T4C7R18-2nt-Rec	AAATTTTAGAACCCTTTCAACGCAAGGAT
Edg-T4C7R20-2nt-Rec	TAAGCAATAAAGCCTCAAAGAATTAGCAAA

Table S45. Edge staples of tile *c* in the reconfiguration of barrels to polymers (Fig. 7A and fig. S9).

Name	Sequence
Edg-T1C7R02-DHP	GTGTCGTAGACACTCCCAATTCTGCGAACCCATATAACAGTTGATGTGTCGTAGACAC
Edg-T1C7R06-DHP	GTGTCGTAGACACCCATAAATCAAAAATCCAGAAAACGAGAATGAGTGTGTCGTAGACAC
Edg-T1C7R10-DHP	GTGTCGTAGACACGAAACACCAGAACGAGAGGCTTGCCCTGACGAGTGTGTCGTAGACAC
Edg-T1C7R14-DHP	GTGTCGTAGACACGAAACGAGGGTAGCAACGCGAAAGACAGCATCGGTGTGTCGTAGACAC
Edg-T1C7R18-DHP	GTGTCGTAGACACGGGATTTTGCTAAACAAATGAATTTTCTGTATGTGTCGTAGACAC
Edg-T2C7R02-DHP	GTGTCGTAGACACGAGAGGGTTGATATAAGCGGATAAGTGCCGTCGTGTCGTAGACAC
Edg-T2C7R06-DHP	GTGTCGTAGACACGACGGTCAGACGATTGTTGACAGGAGGTTGAGGTGTGTCGTAGACAC
Edg-T2C7R10-DHP	GTGTCGTAGACACGCGCCAAAGACAAAAGTTCATATGGTTTACCAGTGTGTCGTAGACAC
Edg-T2C7R14-DHP	GTGTCGTAGACACTTTTTTGTTTAACGTCTCCAAATAAGAAAACGAGTGTGTCGTAGACAC
Edg-T2C7R18-DHP	GTGTCGTAGACACTAAACCAAGTACCGCATTCCAAGAACGGGTATGTGTCGTAGACAC
Edg-T3C7R00-2nt-G4	ATGTAAAGTAATTCTGTCAAAGTACCGACAAAAG
Edg-T3C7R02-2nt-G4	AAAGTAGGGCTTAATTGAAAAGCCAACGCTCAAC
Edg-T3C7R04-2nt-G4	ATAATGGTTTGAAATACCCTTCTGACCTAAATTT
Edg-T3C7R06-2nt-G4	TAAGTCAATAGTGAATTTTAAAGACGCTGAGAAG
Edg-T3C7R08-2nt-G4	CATGAGCAAAAAGAAGATGATTTCATTTCAATTACC
Edg-T3C7R10-2nt-G4	GGCAATATAATCCTGATTGATGATGGCAATTCAT
Edg-T3C7R12-2nt-G4	GCGTTATCTAAAATATCTAAAGGAATTGAGGAAG
Edg-T3C7R14-2nt-G4	AAACATCGCCATTAATAAAAACTGATAGCCCTAAA
Edg-T3C7R16-2nt-G4	CCTCGTCTGAAATGGATTACATTTTGACGCTCAA
Edg-T3C7R18-2nt-G4	AGTTGATTAGTAATAACATTGTAGCAATACTTCT
Edg-T3C7R20	AGGAACGGTACGCCAGTAAAGGGATTTTAGAC
Edg-T4C7R02-DHP	GTGTCGTAGACACCGGGCGCTAGGGCGCTAAGAAAGCGAAAGGAGGTGTGTCGTAGACAC
Edg-T4C7R06-DHP	GTGTCGTAGACACATCCTGTTTGTATGGTGGCCCCAGCAGGCGAAAGTGTGTCGTAGACAC
Edg-T4C7R10-DHP	GTGTCGTAGACACGTAACGCCAGGGTTTTAAGCGGATTAAGTTGGGTGTGTCGTAGACAC
Edg-T4C7R14-DHP	GTGTCGTAGACACTTTAAATTGTAAACGTATTGTATAAGCAAATAGTGTGTCGTAGACAC
Edg-T4C7R18-DHP	GTGTCGTAGACACAAATTTTTAGAACCTTTTCAACGCAAGGATAAGTGTGTCGTAGACAC