Supplementary Information

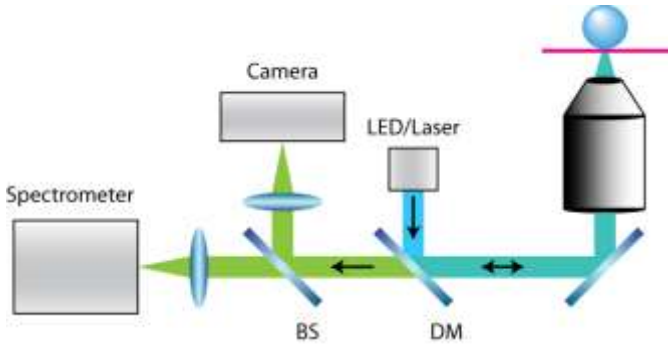

Fig. S1. Optical setup. An inverted microscope is used to image, excite and collect light from the sample. For the bioluminescence experiments the LED/laser source and dichroic mirror (DM) are removed.

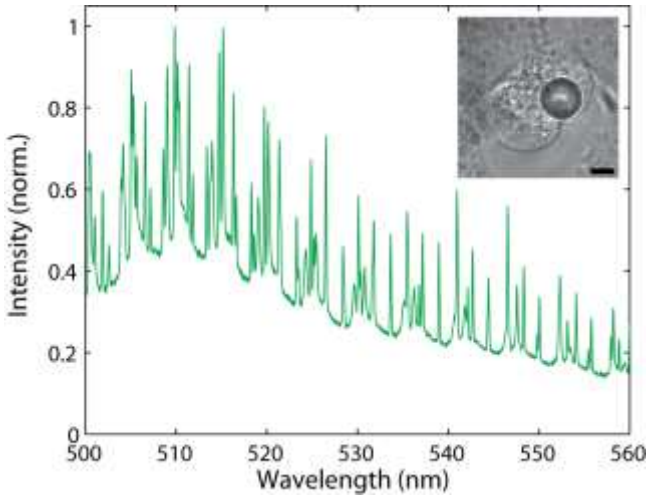

Fig. S2. Spectrum from bead in a cell. WGMs in the spectra of a GFP coated $BaTiO_3$ bead in a HeLa cell undergoing cellular division (in Fig. 2). Scale bar, 5 μm.

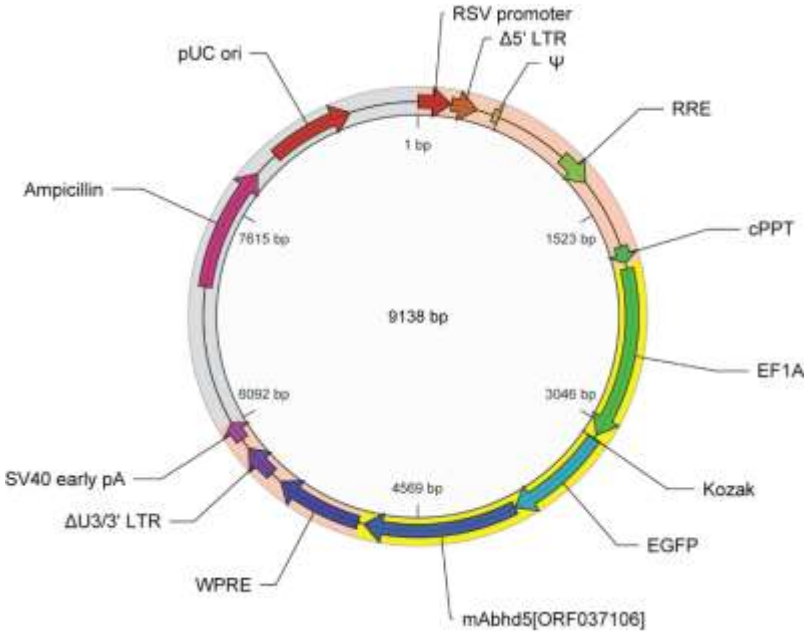

Fig. S3. GFP-ABHD5. A genetic map of the vector used in the transduction of 3T3-L1 adipocytes.

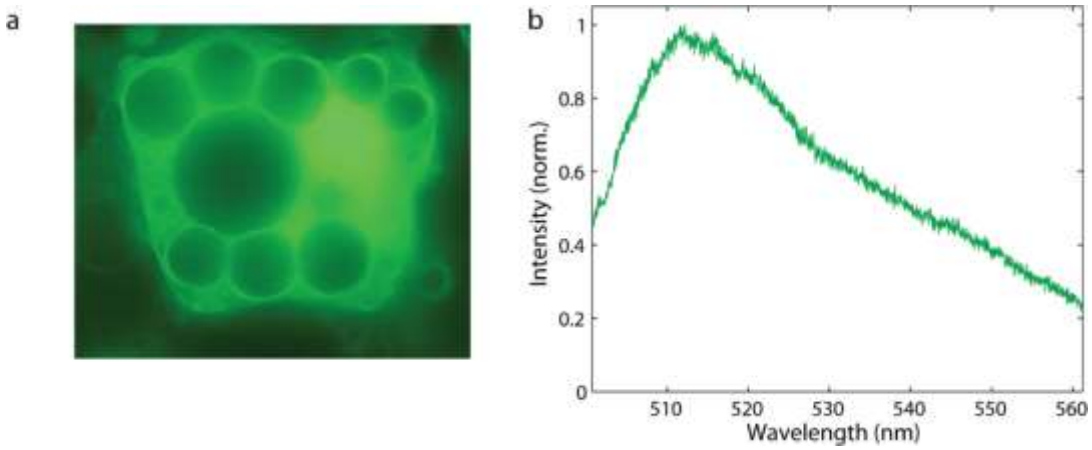

Fig. S4. Fluorescence of a GFP-transduced adipocyte, without ABHD5. (a) A typical fluorescent image showing bright emission from the cytoplasm, whereas fluorescence in adipocytes transfected with GFP-ABHD5 were more predominantly produced at the surface of lipid droplets (Fig. 4b). (b) A typical emission spectrum showing broad spontaneous emission from the GFP and no apparent spectral features associated with the WGMs of lipid droplets.

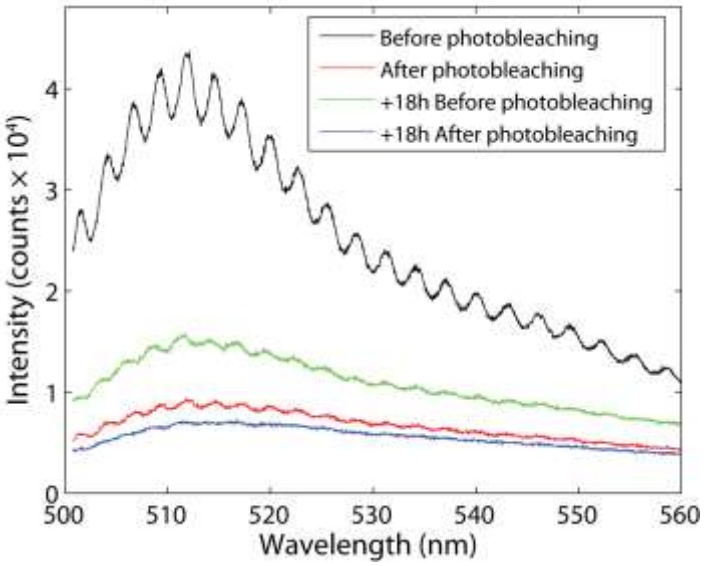

Fig. S5. Time-lapse spectra showing the photobleaching and recovery of GFP fluorescence from a GFP-ABHD5-transfected adipocyte (in Fig. 4c).

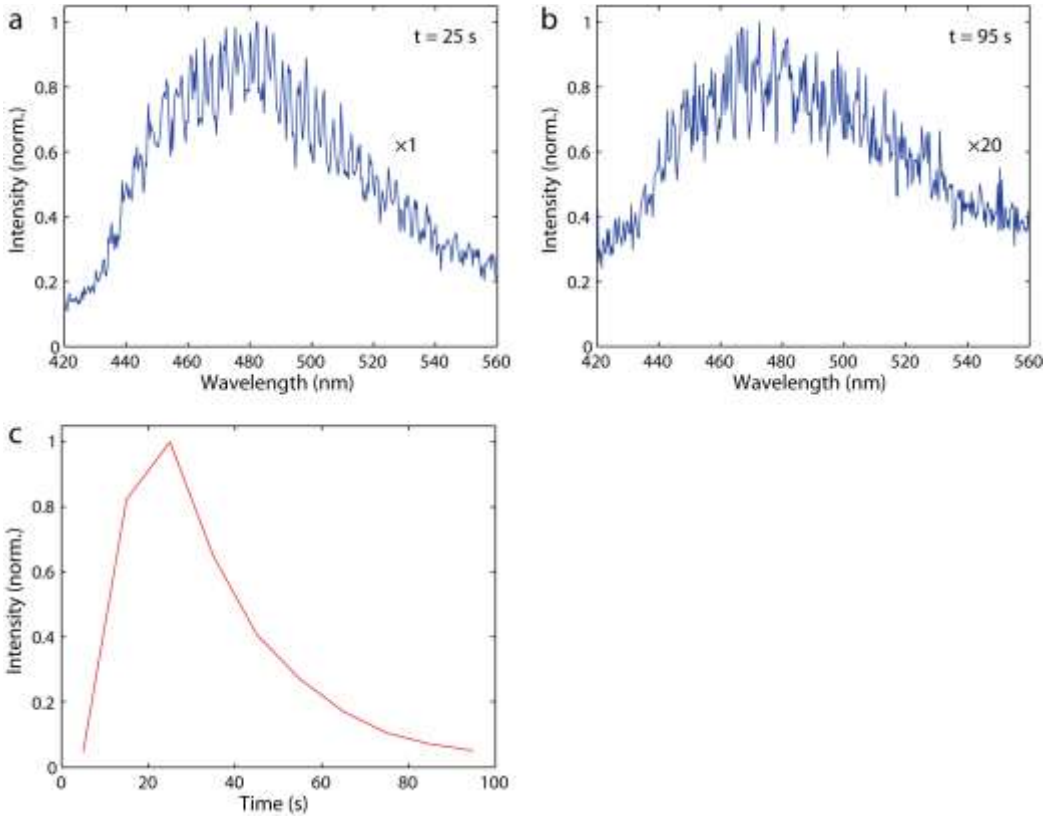

Fig. S6. Cavity-modified bioluminescence. (a,b) Spectra of light emitted by the bead in Fig. 4 at 25 s after the addition of luciferin when the light output is at maximum, (a), and after 95 s, (b). (c) Time trace of the bioluminescence intensity after CTZ was added to the beads at t = 0. The total intensity initially increases and then decreases exponentially.

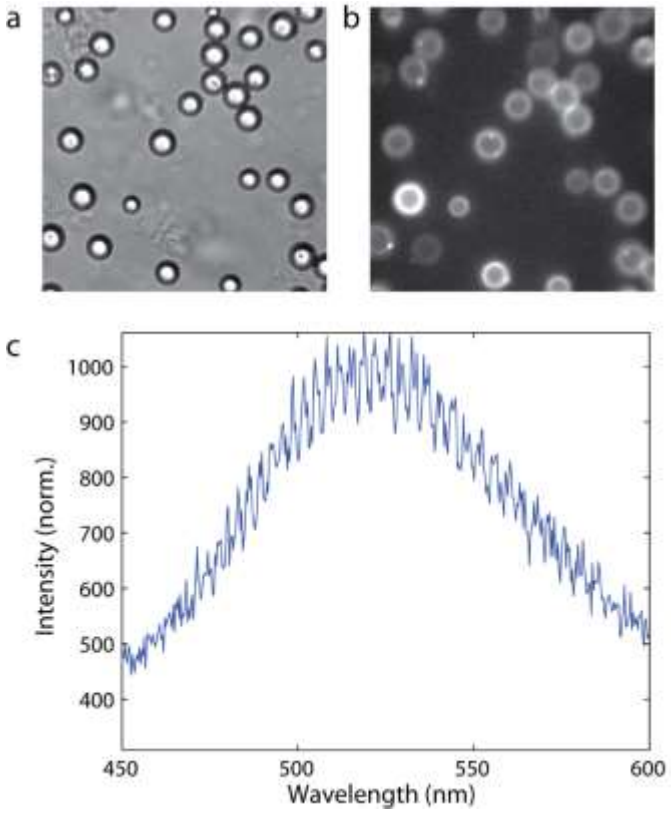

Fig. S7. RLuc8.6-coated glass beads. (a) Bright-field image of soda lime glass beads with diameters ranging from 15 to 19 μm (Cospheric). The beads were functionalized according to a protocol described by Ribeiro *et al*. in "Immobilization of luciferase from a firefly lantern extract on glass strips as an alternative strategy for luminescent detection of ATP," J. Biolumin. Chemilumin. **13**, 371–378, 1998. Briefly, we used 3 mg/ml Renilla luciferase (RLuc8.6) and 3 mg/ml poly-L-lysine hydrobromide (MW 30,000-70,000, Sigma) in Tris buffer (pH 7.4) and incubated beads in this solution at 4°C for 24 h. The beads were then washed five times with Tris buffer and transferred to PBS. (b) Bioluminescent image of the beads. (c) Spectrum of light from a single bead. WGM spectral peaks are visible.

GFP-ABHD5 vector sequence used in the transduction of 3T3-L1 adipocytes

```
   1 AATGTAGTCT TATGCAATAC TCTTGTAGTC TTGCAACATG GTAACGATGA GTTAGCAACA
  61 TGCCTTACAA GGAGAGAAAA AGCACCGTGC ATGCCGATTG GTGGAAGTAA GGTGGTACGA
 121 TCGTGCCTTA TTAGGAAGGC AACAGACGGG TCTGACATGG ATTGGACGAA CCACTGAATT
 181 GCCGCATTGC AGAGATATTG TATTTAAGTG CCTAGCTCGA TACATAAACG GGTCTCTCTG
 241 GTTAGACCAG ATCTGAGCCT GGGAGCTCTC TGGCTAACTA GGGAACCCAC TGCTTAAGCC
 301 TCAATAAAGC TTGCCTTGAG TGCTTCAAGT AGTGTGTGCC CGTCTGTTGT GTGACTCTGG
 361 TAACTAGAGA TCCCTCAGAC CCTTTTAGTC AGTGTGGAAA ATCTCTAGCA GTGGCGCCCG
 421 AACAGGGACT TGAAAGCGAA AGGGAAACCA GAGGAGCTCT CTCGACGCAG GACTCGGCTT
 481 GCTGAAGCGC GCACGGCAAG AGGCGAGGGG CGGCGACTGG TGAGTACGCC AAAAATTTTG
 541 ACTAGCGGAG GCTAGAAGGA GAGAGATGGG TGCGAGAGCG TCAGTATTAA GCGGGGGAGA
 601 ATTAGATCGC GATGGGAAAA AATTCGGTTA AGGCCAGGGG GAAAGAAAAA ATATAAATTA
 661 AAACATATAG TATGGGCAAG CAGGGAGCTA GAACGATTCG CAGTTAATCC TGGCCTGTTA
 721 GAAACATCAG AAGGCTGTAG ACAAATACTG GGACAGCTAC AACCATCCCT TCAGACAGGA
 781 TCAGAAGAAC TTAGATCATT ATATAATACA GTAGCAACCC TCTATTGTGT GCATCAAAGG
 841 ATAGAGATAA AAGACACCAA GGAAGCTTTA GACAAGATAG AGGAAGAGCA AAACAAAAGT
 901 AAGACCACCG CACAGCAAGC GGCCGCTGAT CTTCAGACCT GGAGGAGGAG ATATGAGGGA
 961 CAATTGGAGA AGTGAATTAT ATAAATATAA AGTAGTAAAA ATTGAACCAT TAGGAGTAGC
1021 ACCCACCAAG GCAAAGAGAA GAGTGGTGCA GAGAGAAAAA AGAGCAGTGG GAATAGGAGC
1081 TTTGTTCCTT GGGTTCTTGG GAGCAGCAGG AAGCACTATG GGCGCAGCGT CAATGACGCT
1141 GACGGTACAG GCCAGACAAT TATTGTCTGG TATAGTGCAG CAGCAGAACA ATTTGCTGAG
1201 GGCTATTGAG GCGCAACAGC ATCTGTTGCA ACTCACAGTC TGGGGCATCA AGCAGCTCCA
1261 GGCAAGAATC CTGGCTGTGG AAAGATACCT AAAGGATCAA CAGCTCCTGG GGATTTGGGG
1321 TTGCTCTGGA AAACTCATTT GCACCACTGC TGTGCCTTGG AATGCTAGTT GGAGTAATAA
1381 ATCTCTGGAA CAGATTTGGA ATCACACGAC CTGGATGGAG TGGGACAGAG AAATTAACAA
1441 TTACACAAGC TTAATACACT CCTTAATTGA AGAATCGCAA AACCAGCAAG AAAAGAATGA
1501 ACAAGAATTA TTGGAATTAG ATAAATGGGC AAGTTTGTGG AATTGGTTTA ACATAACAAA
1561 TTGGCTGTGG TATATAAAAT TATTCATAAT GATAGTAGGA GGCTTGGTAG GTTTAAGAAT
1621 AGTTTTTGCT GTACTTTCTA TAGTGAATAG AGTTAGGCAG GGATATTCAC CATTATCGTT
1681 TCAGACCCAC CTCCCAACCC CGAGGGGACC CGACAGGCCC GAAGGAATAG AAGAAGAAGG
1741 TGGAGAGAGA GACAGAGACA GATCCATTCG ATTAGTGAAC GGATCTCGAC GGTATCGCTA
1801 GCTTTTAAAA GAAAAGGGGG GATTGGGGGG TACAGTGCAG GGGAAAGAAT AGTAGACATA
1861 ATAGCAACAG ACATACAAAC TAAAGAATTA CAAAAACAAA TTACAAAAAT TCAAAATTTT
1921 ACTAGTGATT ATCGGATCAA CTTTGTATAG AAAAGTTGGG CTCCGGTGCC CGTCAGTGGG
1981 CAGAGCGCAC ATCGCCCACA GTCCCCGAGA AGTTGGGGGG AGGGGTCGGC AATTGAACCG
2041 GTGCCTAGAG AAGGTGGCGC GGGGTAAACT GGGAAAGTGA TGTCGTGTAC TGGCTCCGCC
2101 TTTTTCCCGA GGGTGGGGGA GAACCGTATA TAAGTGCAGT AGTCGCCGTG AACGTTCTTT
2161 TTCGCAACGG GTTTGCCGCC AGAACACAGG TAAGTGCCGT GTGTGGTTCC CGCGGGCCTG
2221 GCCTCTTTAC GGGTTATGGC CCTTGCGTGC CTTGAATTAC TTCCACCTGG CTGCAGTACG
2281 TGATTCTTGA TCCCGAGCTT CGGGTTGGAA GTGGGTGGGA GAGTTCGAGG CCTTGCGCTT
2341 AAGGAGCCCC TTCGCCTCGT GCTTGAGTTG AGGCCTGGCC TGGGCGCTGG GGCCGCCGCG
2401 TGCGAATCTG GTGGCACCTT CGCGCCTGTC TCGCTGCTTT CGATAAGTCT CTAGCCATTT
2461 AAAATTTTTG ATGACCTGCT GCGACGCTTT TTTTCTGGCA AGATAGTCTT GTAAATGCGG
2521 GCCAAGATCT GCACACTGGT ATTTCGGTTT TTGGGGCCGC GGGCGGCGAC GGGGCCCGTG
2581 CGTCCCAGCG CACATGTTCG GCGAGGCGGG GCCTGCGAGC GCGGCCACCG AGAATCGGAC
2641 GGGGGTAGTC TCAAGCTGGC CGGCCTGCTC TGGTGCCTGG TCTCGCGCCG CCGTGTATCG
2701 CCCCGCCCTG GGCGGCAAGG CTGGCCCGGT CGGCACCAGT TGCGTGAGCG GAAAGATGGC
2761 CGCTTCCCGG CCCTGCTGCA GGGAGCTCAA AATGGAGGAC GCGGCGCTCG GGAGAGCGGG
2821 CGGGTGAGTC ACCCACACAA AGGAAAAGGG CCTTTCCGTC CTCAGCCGTC GCTTCATGTG
2881 ACTCCACGGA GTACCGGGCG CCGTCCAGGC ACCTCGATTA GTTCTCGAGC TTTTGGAGTA
2941 CGTCGTCTTT AGGTTGGGGG GAGGGGTTTT ATGCGATGGA GTTTCCCCAC ACTGAGTGGG
3001 TGGAGACTGA AGTTAGGCCA GCTTGGCACT TGATGTAATT CTCCTTGGAA TTTGCCCTTT
3061 TTGAGTTTGG ATCTTGGTTC ATTCTCAAGC CTCAGACAGT GGTTCAAAGT TTTTTTCTTC
3121 CATTTCAGGT GTCGTGACAA GTTTGTACAA AAAAGCAGGC TGCCACCATG GTGAGCAAGG
```

3181 GCGAGGAGCT GTTCACCGGG GTGGTGCCCA TCCTGGTCGA GCTGGACGGC GACGTAAACG
3241 GCCACAAGTT CAGCGTGTCC GGCGAGGGCG AGGGCGATGC CACCTACGGC AAGCTGACCC
3301 TGAAGTTCAT CTGCACCACC GGCAAGCTGC CCGTGCCCTG GCCCACCCTC GTGACCACCC
3361 TGACCTACGG CGTGCAGTGC TTCAGCCGCT ACCCCGACCA CATGAAGCAG CACGACTTCT
3421 TCAAGTCCGC CATGCCCGAA GGCTACGTCC AGGAGCGCAC CATCTTCTTC AAGGACGACG
3481 GCAACTACAA GACCCGCGCC GAGGTGAAGT TCGAGGGCGA CACCCTGGTG AACCGCATCG
3541 AGCTGAAGGG CATCGACTTC AAGGAGGACG GCAACATCCT GGGGCACAAG CTGGAGTACA
3601 ACTACAACAG CCACAACGTC TATATCATGG CCGACAAGCA GAAGAACGGC ATCAAGGTGA
3661 ACTTCAAGAT CCGCCACAAC ATCGAGGACG GCAGCGTGCA GCTCGCCGAC CACTACCAGC
3721 AGAACACCCC CATCGGCGAC GGCCCCGTGC TGCTGCCCGA CAACCACTAC CTGAGCACCC
3781 AGTCCGCCCT GAGCAAAGAC CCCAACGAGA AGCGCGATCA CATGGTCCTG CTGGAGTTCG
3841 TGACCGCCGC CGGGATCACT CTCGGCATGG ACGAGCTGTA CAAGATGAAA GCGATGGCGG
3901 CGGAGGAGGA GGTGGACTCG GCAGACGCCG GTGGAGGGTC AGGATGGCTG ACAGGGTGGC
3961 TTCCTACCTG GTGTCCCACA TCTACATCAC ACCTTAAAGA AGCTGAAGAG AAAATGTTAA
4021 AATGTGTCCC CTGCACTTAC AAGAAAGAGC CTGTGCGCAT ATCCAATGGA AACAGAATAT
4081 GGACGCTGAT GTTCTCTCAC AACATTTCTA GTAAGACGCC ACTTGTCCTC CTTCATGGTT
4141 TTGGAGGAGG TCTTGGACTT TGGGCCCTGA ATTTTGAAGA TCTAAGCACC GATAGGCCTG
4201 TCTATGCCTT TGACCTATTG GGCTTCGGAA GAAGTAGTAG ACCTAGGTTT GACAGTGATG
4261 CGGAAGAAGT GGAGAATCAG TTTGTGGAAT CCATTGAAGA GTGGAGATGT GCCCTCAGGT
4321 TGGACAAAAT GATCTTGCTT GGACACAACC TGGGAGGGTT CTTGGCTGCC GCTTACTCAC
4381 TGAAGTACCC ATCAAGGGTT AGTCACCTCA TTTTAGTAGA GCCATGGGGT TTTCCTGAGC
4441 GACCAGATCT TGCTGATCAA GAGAGACCAA TTCCAGTTTG GATCAGGGCC CTAGGGGCAG
4501 CATTGACTCC CTTTAACCCC TTGGCTGGCC TCAGGATTGC AGGACCTTTT GGGTTAAGTC
4561 TAGTGCAGCG TTTGAGGCCT GATTTCAAGC GGAAGTACTC CTCTATGTTT GAAGATGACA
4621 CGGTGACAGA GTACATCTAC CACTGTAATG TACAAACCCC AAGTGGTGAG ACAGCTTTCA
4681 AAAACATGAC GATTCCTTAT GGGTGGGCCA AACGGCCAAT GCTTCAGCGG ATAGGTGGCT
4741 TGCATCCTGA CATTCCAGTT TCAGTGATCT TTGGAGCCCG ATCCTGCATA GATGGCAACT
4801 CTGGAACCAG CATCCAGTCA CTGCGACCGA AGTCCTACGT GAAGACAATT GCCATCCTCG
4861 GGGCGGGGCA TTATGTGTAT GCAGATCAGC CAGAAGAATT CAACCAGAAA GTCAAGGAGA
4921 TCTGCCACAC AGTAGACTGA ACCCAGCTTT CTTGTACAAA GTGGTGATAA TCGAATTCCG
4981 ATAATCAACC TCTGGATTAC AAAATTTGTG AAAGATTGAC TGGTATTCTT AACTATGTTG
5041 CTCCTTTTAC GCTATGTGGA TACGCTGCTT TAATGCCTTT GTATCATGCT ATTGCTTCCC
5101 GTATGGCTTT CATTTTCTCC TCCTTGTATA AATCCTGGTT GCTGTCTCTT TATGAGGAGT
5161 TGTGGCCCGT TGTCAGGCAA CGTGGCGTGG TGTGCACTGT GTTTGCTGAC GCAACCCCCA
5221 CTGGTTGGGG CATTGCCACC ACCTGTCAGC TCCTTTCCGG GACTTTCGCT TTCCCCCTCC
5281 CTATTGCCAC GGCGGAACTC ATCGCCGCCT GCCTTGCCCG CTGCTGGACA GGGGCTCGGC
5341 TGTTGGGCAC TGACAATTCC GTGGTGTTGT CGGGGAAGCT GACGTCCTTT CCATGGCTGC
5401 TCGCCTGTGT TGCCACCTGG ATTCTGCGCG GGACGTCCTT CTGCTACGTC CCTTCGGCCC
5461 TCAATCCAGC GGACCTTCCT TCCCGCGGCC TGCTGCCGGC TCTGCGGCCT CTTCCGCGTC
5521 TTCGCCTTCG CCCTCAGACG AGTCGGATCT CCCTTTGGGC CGCCTCCCCG CATCGGGAAT
5581 TCCCGCGGTT CGCTTTAAGA CCAATGACTT ACAAGGCAGC TGTAGATCTT AGCCACTTTT
5641 TAAAAGAAAA GGGGGGACTG GAAGGGCTAA TTCACTCCCA ACGAAGACAA GATCTGCTTT
5701 TTGCTTGTAC TGGGTCTCTC TGGTTAGACC AGATCTGAGC CTGGGAGCTC TCTGGCTAAC
5761 TAGGGAACCC ACTGCTTAAG CCTCAATAAA GCTTGCCTTG AGTGCTTCAA GTAGTGTGTG
5821 CCCGTCTGTT GTGTGACTCT GGTAACTAGA GATCCCTCAG ACCCTTTTAG TCAGTGTGGA
5881 AAATCTCTAG CAGTAGTAGT TCATGTCATC TTATTATTCA GTATTTATAA CTTGCAAAGA
5941 AATGAATATC AGAGAGTGAG AGGAACTTGT TTATTGCAGC TTATAATGGT TACAAATAAA
6001 GCAATAGCAT CACAAATTTC ACAAATAAAG CATTTTTTTC ACTGCATTCT AGTTGTGGTT
6061 TGTCCAAACT CATCAATGTA TCTTATCATG TCTGGCTCTA GCTATCCCGC CCCTAACTCC
6121 GCCCATCCCG CCCCTAACTC CGCCCAGTTC CGCCCATTCT CCGCCCCATG GCTGACTAAT
6181 TTTTTTTATT TATGCAGAGG CCGAGGCCGC CTCGGCCTCT GAGCTATTCC AGAAGTAGTG
6241 AGGAGGCTTT TTTGGAGGCC TAGGGACGTA CCCAATTCGC CCTATAGTGA GTCGTATTAC
6301 GCGCGCTCAC TGGCCGTCGT TTTACAACGT CGTGACTGGG AAAACCCTGG CGTTACCCAA
6361 CTTAATCGCC TTGCAGCACA TCCCCCTTTC GCCAGCTGGC GTAATAGCGA AGAGGCCCGC
6421 ACCGATCGCC CTTCCCAACA GTTGCGCAGC CTGAATGGCG AATGGGACGC GCCCTGTAGC
6481 GGCGCATTAA GCGCGGCGGG TGTGGTGGTT ACGCGCAGCG TGACCGCTAC ACTTGCCAGC
6541 GCCCTAGCGC CCGCTCCTTT CGCTTTCTTC CCTTCCTTTC TCGCCACGTT CGCCGGCTTT

6601 CCCCGTCAAG CTCTAAATCG GGGGCTCCCT TTAGGGTTCC GATTTAGTGC TTTACGGCAC
6661 CTCGACCCCA AAAAACTTGA TTAGGGTGAT GGTTCACGTA GTGGGCCATC GCCCTGATAG
6721 ACGGTTTTTC GCCCTTTGAC GTTGGAGTCC ACGTTCTTTA ATAGTGGACT CTTGTTCCAA
6781 ACTGGAACAA CACTCAACCC TATCTCGGTC TATTCTTTTG ATTTATAAGG GATTTTGCCG
6841 ATTTCGGCCT ATTGGTTAAA AAATGAGCTG ATTTAACAAA AATTTAACGC GAATTTTAAC
6901 AAAATATTAA CGCTTACAAT TTAGGTGGCA CTTTTCGGGG AAATGTGCGC GGAACCCCTA
6961 TTTGTTTATT TTTCTAAATA CATTCAAATA TGTATCCGCT CATGAGACAA TAACCCTGAT
7021 AAATGCTTCA ATAATATTGA AAAAGGAAGA GTATGAGTAT TCAACATTTC CGTGTCGCCC
7081 TTATTCCCTT TTTTGCGGCA TTTTGCCTTC CTGTTTTTGC TCACCCAGAA ACGCTGGTGA
7141 AAGTAAAAGA TGCTGAAGAT CAGTTGGGTG CACGAGTGGG TTACATCGAA CTGGATCTCA
7201 ACAGCGGTAA GATCCTTGAG AGTTTTCGCC CCGAAGAACG TTTTCCAATG ATGAGCACTT
7261 TTAAAGTTCT GCTATGTGGC GCGGTATTAT CCCGTATTGA CGCCGGGCAA GAGCAACTCG
7321 GTCGCCGCAT ACACTATTCT CAGAATGACT TGGTTGAGTA CTCACCAGTC ACAGAAAAGC
7381 ATCTTACGGA TGGCATGACA GTAAGAGAAT TATGCAGTGC TGCCATAACC ATGAGTGATA
7441 ACACTGCGGC CAACTTACTT CTGACAACGA TCGGAGGACC GAAGGAGCTA ACCGCTTTTT
7501 TGCACAACAT GGGGGATCAT GTAACTCGCC TTGATCGTTG GGAACCGGAG CTGAATGAAG
7561 CCATACCAAA CGACGAGCGT GACACCACGA TGCCTGTAGC AATGGCAACA ACGTTGCGCA
7621 AACTATTAAC TGGCGAACTA CTTACTCTAG CTTCCCGGCA ACAATTAATA GACTGGATGG
7681 AGGCGGATAA AGTTGCAGGA CCACTTCTGC GCTCGGCCCT TCCGGCTGGC TGGTTTATTG
7741 CTGATAAATC TGGAGCCGGT GAGCGTGGGT CTCGCGGTAT CATTGCAGCA CTGGGGCCAG
7801 ATGGTAAGCC CTCCCGTATC GTAGTTATCT ACACGACGGG GAGTCAGGCA ACTATGGATG
7861 AACGAAATAG ACAGATCGCT GAGATAGGTG CCTCACTGAT TAAGCATTGG TAACTGTCAG
7921 ACCAAGTTTA CTCATATATA CTTTAGATTG ATTTAAAACT TCATTTTTAA TTTAAAAGGA
7981 TCTAGGTGAA GATCCTTTTT GATAATCTCA TGACCAAAAT CCCTTAACGT GAGTTTTCGT
8041 TCCACTGAGC GTCAGACCCC GTAGAAAAGA TCAAAGGATC TTCTTGAGAT CCTTTTTTTC
8101 TGCGCGTAAT CTGCTGCTTG CAAACAAAAA AACCACCGCT ACCAGCGGTG GTTTGTTTGC
8161 CGGATCAAGA GCTACCAACT CTTTTTCCGA AGGTAACTGG CTTCAGCAGA GCGCAGATAC
8221 CAAATACTGT TCTTCTAGTG TAGCCGTAGT TAGGCCACCA CTTCAAGAAC TCTGTAGCAC
8281 CGCCTACATA CCTCGCTCTG CTAATCCTGT TACCAGTGGC TGCTGCCAGT GGCGATAAGT
8341 CGTGTCTTAC CGGGTTGGAC TCAAGACGAT AGTTACCGGA TAAGGCGCAG CGGTCGGGCT
8401 GAACGGGGGG TTCGTGCACA CAGCCCAGCT TGGAGCGAAC GACCTACACC GAACTGAGAT
8461 ACCTACAGCG TGAGCTATGA GAAAGCGCCA CGCTTCCCGA AGGGAGAAAG GCGGACAGGT
8521 ATCCGGTAAG CGGCAGGGTC GGAACAGGAG AGCGCACGAG GGAGCTTCCA GGGGGAAACG
8581 CCTGGTATCT TTATAGTCCT GTCGGGTTTC GCCACCTCTG ACTTGAGCGT CGATTTTTGT
8641 GATGCTCGTC AGGGGGGCGG AGCCTATGGA AAAACGCCAG CAACGCGGCC TTTTTACGGT
8701 TCCTGGCCTT TTGCTGGCCT TTTGCTCACA TGTTCTTTCC TGCGTTATCC CCTGATTCTG
8761 TGGATAACCG TATTACCGCC TTTGAGTGAG CTGATACCGC TCGCCGCAGC CGAACGACCG
8821 AGCGCAGCGA GTCAGTGAGC GAGGAAGCGG AAGAGCGCCC AATACGCAAA CCGCCTCTCC
8881 CCGCGCGTTG GCCGATTCAT TAATGCAGCT GGCACGACAG GTTTCCCGAC TGGAAAGCGG
8941 GCAGTGAGCG CAACGCAATT AATGTGAGTT AGCTCACTCA TTAGGCACCC CAGGCTTTAC
9001 ACTTTATGCT TCCGGCTCGT ATGTTGTGTG GAATTGTGAG CGGATAACAA TTTCACACAG
9061 GAAACAGCTA TGACCATGAT TACGCCAAGC GCGCAATTAA CCCTCACTAA AGGGAACAAA
9121 AGCTGGAGCT GCAAGCTT