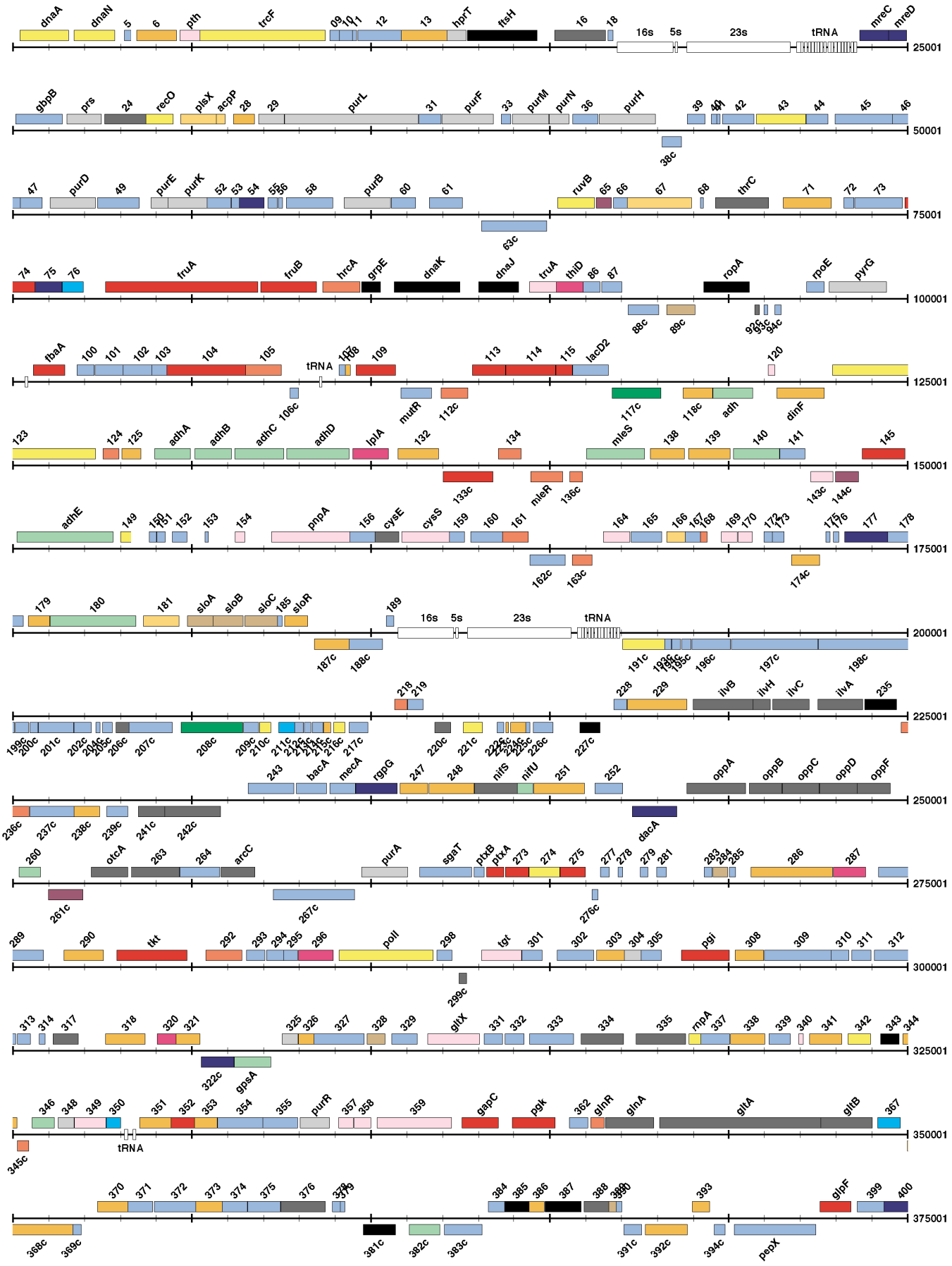
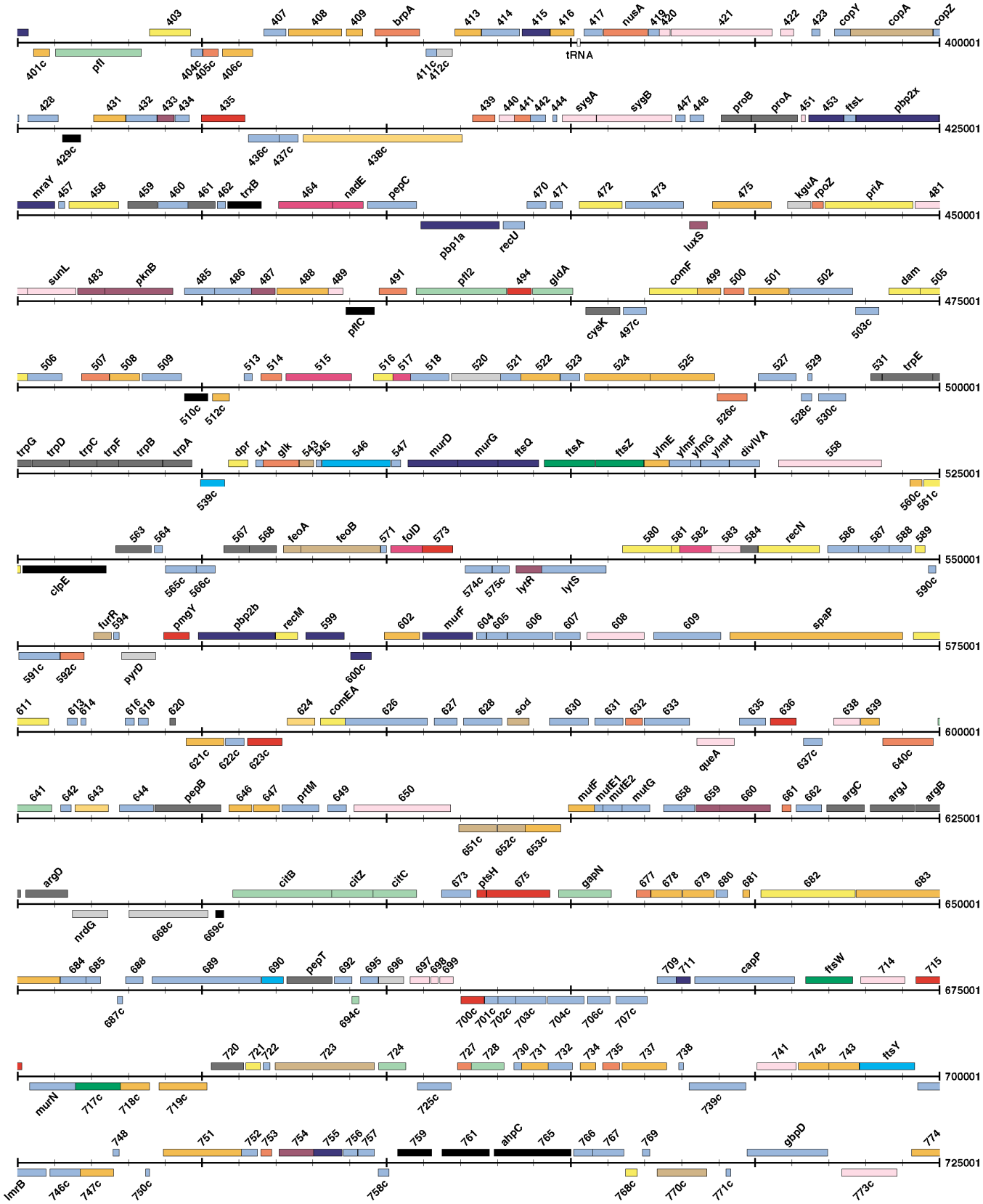
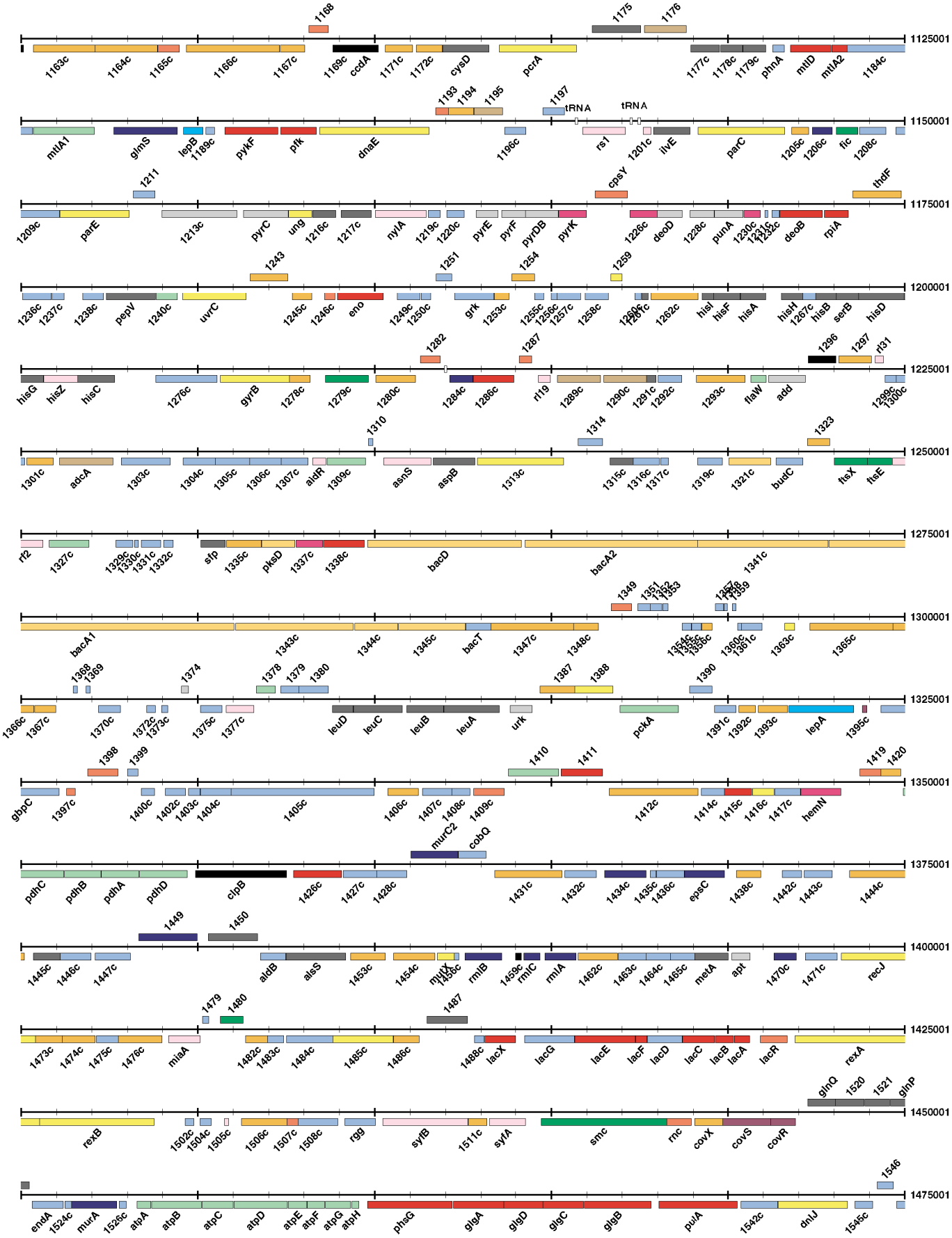
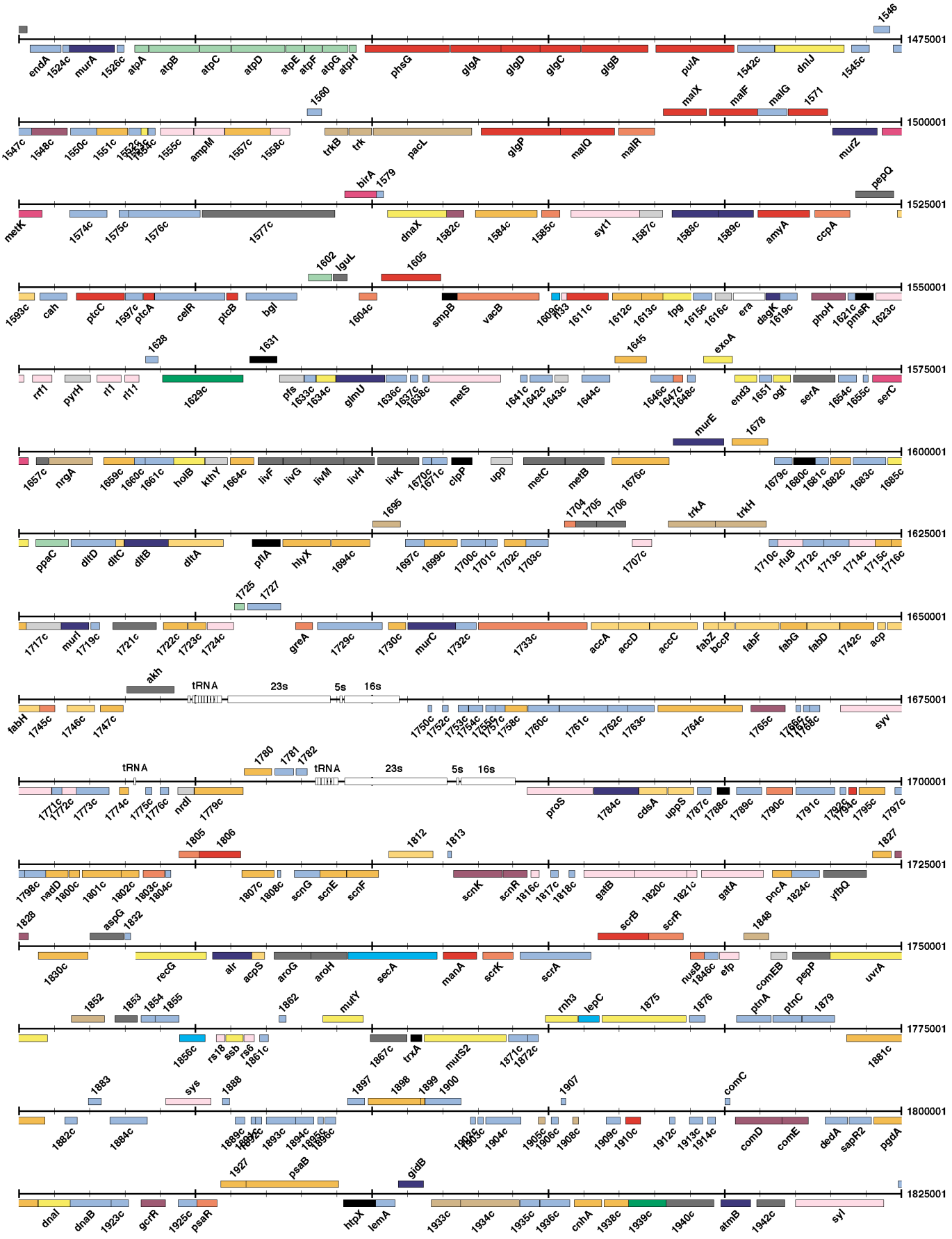
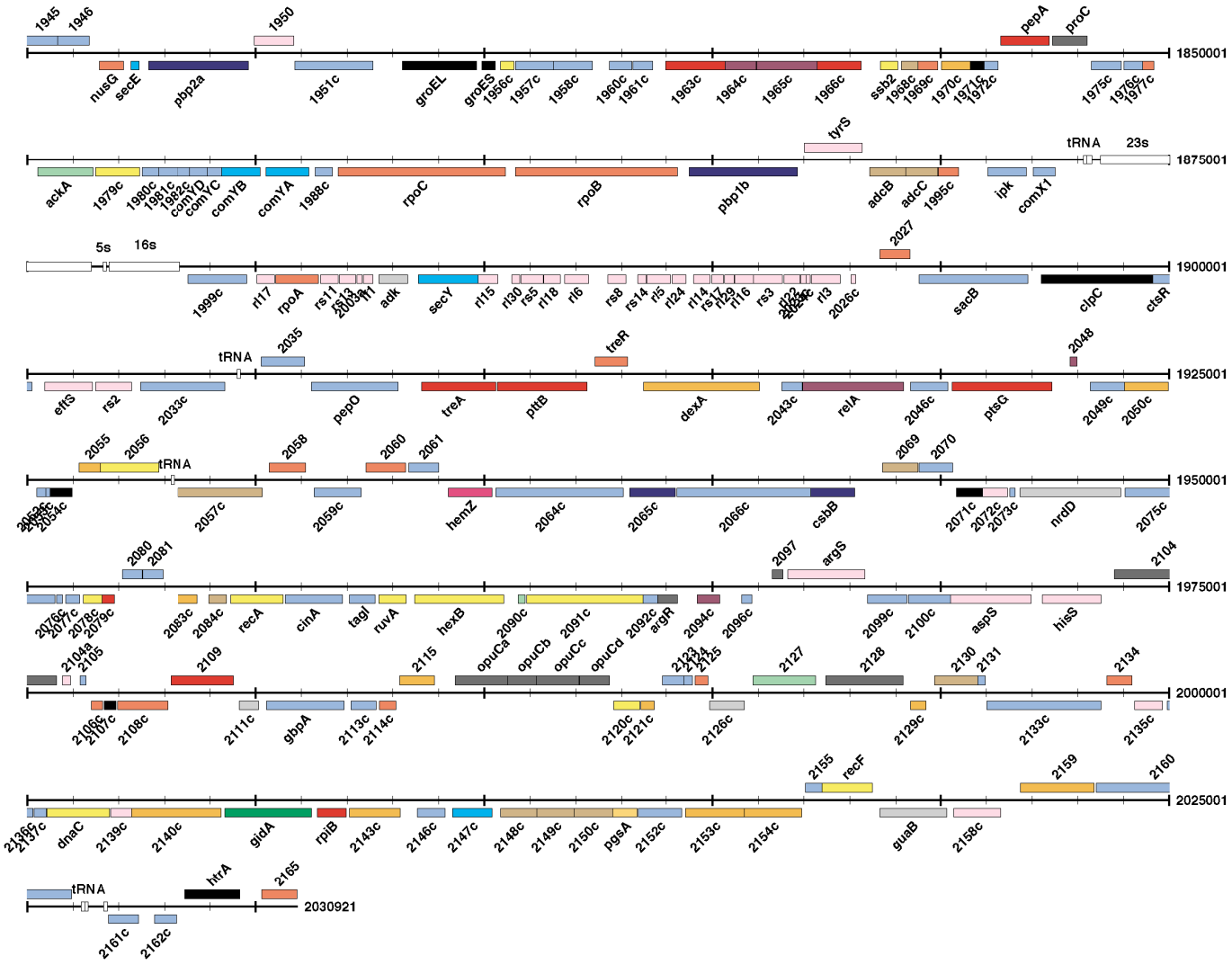

dnaA
dnaN
5
6
pth
trcF
09
10
11
12
13
hprT
ftsH
16
18
16s
5s
23s
tRNA
mreC
mreD
25001
gbpB
prs
24
recO
plsX
acpP
28
29
purL
31
purF
33
purM
purN
36
purH
39
40
41
42
43
44
45
46
50001
38c
47
purD
49
purE
purK
52
53
54
55
56
58
purB
60
61
ruvB
65
66
67
68
thrC
71
72
73
75001
63c
74
75
76
fruA
fruB
hrcA
grpE
dnaK
dnaJ
truA
thiD
86
87
ropA
rpoE
pyrG
100001
88c
89c
92c
93c
94c
fbaA
100
101
102
103
104
105
tRNA
107
108
109
113
114
115
lacD2
120
125001
106c
mutR
112c
117c
118c
adh
dinF
123
124
125
adhA
adhB
adhC
adhD
lplA
132
134
mleS
138
139
140
141
145
150001
133c
mleR
136c
143c
144c
adhE
149
150
151
152
153
154
pnpA
156
cysE
cysS
159
160
161
164
165
166
167
168
169
170
172
173
175
176
177
178
175001
162c
163c
174c
179
180
181
sloA
sloB
sloC
185
sloR
189
16s
5s
23s
tRNA
200001
187c
188c
191c
193c
194c
195c
196c
197c
198c
218
219
228
229
ilvB
ilvH
ilvC
ilvA
235
225001
199c
200c
201c
202c
204c
205c
206c
207c
208c
209c
210c
211c
212c
213c
214c
215c
216c
217c
220c
221c
222c
223c
224c
225c
226c
227c
243
bacA
mecA
rpgG
247
248
nifS
nifU
251
252
oppA
oppB
oppC
oppD
oppF
250001
236c
237c
238c
239c
241c
242c
dacA
260
otcA
263
264
arcC
purA
sgaT
ptxB
ptxA
273
274
275
277
278
279
281
283
284
285
286
287
275001
261c
267c
276c
289
290
tkt
292
293
294
295
296
polI
298
tgt
301
302
303
304
305
pgi
308
309
310
311
312
300001
299c
313
314
317
318
320
321
325
326
327
328
329
gltX
331
332
333
334
335
rnpA
337
338
339
340
341
342
343
344
325001
322c
gpsA
346
348
349
350
351
352
353
354
355
purR
357
358
359
gapC
pgk
362
glnR
glnA
gltA
gltB
367
350001
345c
tRNA
370
371
372
373
374
375
376
378
379
384
385
386
387
388
389
390
393
glpF
399
400
375001
368c
369c
381c
382c
383c
391c
392c
394c
pepX


400001
403 407 408 409 brpA 413 414 415 416 417 nusA 419 420 421 422 423 copY copA copZ
401c pfl 404c 405c 406c 411c 412c tRNA
425001
428 431 432 433 434 435 439 440 441 442 444 sygA sygB 447 448 proB proA 451 453 ftsL pbp2x
429c 436c 437c 438c
450001
mraY 457 458 459 460 461 462 trxB 464 nadE pepC 470 471 472 473 475 kguA rpoZ priA 481
pbp1a recU luxS
475001
sunL 483 pknB 485 486 487 488 489 491 pfl2 494 gldA comF 499 500 501 502 dam 505
pflC cysK 497c 503c
500001
506 507 508 509 513 514 515 516 517 518 520 521 522 523 524 525 527 529 531 trpE
510c 512c 526c 528c 530c
525001
trpG trpD trpC trpF trpB trpA dpr 541 glk 543 545 546 547 murD murG ftsQ ftsA ftsZ ylmE ylmF ylmG ylmH divIVA 558
539c 560c 561c
550001
563 564 567 568 feoA feoB 571 folD 573 580 581 582 583 584 recN 586 587 588 589
clpE 565c 566c 574c 575c lytR lytS 590c
575001
furR 594 pmgY pbp2b recM 599 602 murF 604 605 606 607 608 609 spaP
591c 592c pyrD 600c
600001
611 613 614 616 618 620 624 comEA 626 627 628 sod 630 631 632 633 635 636 638 639
621c 622c 623c queA 637c 640c
625001
641 642 643 644 pepB 646 647 prtM 649 650 mutF mutE1 mutE2 mutG 658 659 660 661 662 argC argJ argB
651c 652c 653c
650001
argD citB citZ citC 673 ptsH 675 gapN 677 678 679 680 681 682 683
nrdG 668c 669c
675001
684 685 688 689 690 pepT 692 695 696 697 698 699 709 711 capP ftsW 714 715
687c 694c 700c 701c 702c 703c 704c 706c 707c
700001
720 721 722 723 724 727 728 730 731 732 734 735 737 738 741 742 743 ftsY
murN 717c 718c 719c 725c 739c
725001
748 751 752 753 754 755 756 757 759 761 ahpC 765 766 767 769 gbpD 774
lmrB 746c 747c 750c 758c 768c 770c 771c 773c

776 aroD aroE aroB aroC 781 782 aroA aroK pheA 787 788 789 790 793 794 795 796 797 800 801 802
750001
775c 791c 798c 799c 803c
804 807 uvrB 811 812 813 mutT 815 816 817 818 820 dnaG rpoD 823 824 rgpA rgpB rgpC rgpD
775001
805c 806c mscL
rgpE rgpF 831 832 833 834 835 836 837 gshR 841 thiI 843 844 845 846 848 849 850 851
800001
folI 840c 847c
852 lspA 854 855 pyrR 857 pyrB pyrA pyrAB 862 863 864 865 866 rimM trmD trxB2 870 pfkB 872 metE 874
825001
agaL msmE msmF msmG gtfA msmK dexB galK galT galE pbpX 890 hsdM hsdS 893
850001
875c msmR galR
895 896 897 898 899 dapB papS 902 905 906 909 gtfD 913 921
875001
911c 914c 915c 916c 917c 919c
922 923 tpx 925 926 927 928 932 933 934 935 936 937 938 939 thyA 946 dfrA 948 clpX 950
900001
929c 930c 940c 941c mvaA 943c
951 952 954 955 958 959 960 961 962 965 966 folC 968 folP folA folK murB potA potB potC potD 977 licT
925001
953c clp 959c 963c
bglP bglB1 bglB2 984 bglA wapA 988 asd dapA 991 992 993 rnh 995 996 997 998 999 1000 smf topA gid
950001
bglC 986c
gtfB gtfC 1006 1007 1008 1009 1014 bcc oadB 1018 citG citB citA citG2
975001
citC citG 1012c 1013c
pycB 1025 1026 1027 1028 1029 1030 xis tnr5 glrA 1036 1041 1042 1048 krpS 1051 1052 1053
1000001
1024c 1034c 1037c 1038c 1039c 1040c 1043c 1044c 1045c 1046c 1047c
1054 1056 guaA 1074 dfp 1076 pgm
1025001
radC satE satD satC ffh ylxM opuAb opuAa 1064c 1065c 1067c 1068c 1069c 1070c 1071c 1072c tthS 1078c 1079c
1087 apbE CDS 1090 wapE 1093 1094
1050001
1080c 1081c glyA 1083c hemK rf1 kitH opuBc opuBa 1097c 1098c 1100c ascB 1104c 1105c 1106c 1107c 1108c
ldh coaA rs20
1075001
1109c 1111c 1112c srtA gyrA 1116c naoX 1118c 1119c 1120c 1121c cdd deoC pdp 1125c ciaH ciaR 1131c pepN
1148 1149 1150 1155
1100001
phoU 1134c pstB pstC pstC1 pstS 1139c 1140c 1141c 1142c 1143c truB 1145c 1146c 1147c 1151c 1152c 1153c 1154c 1156c 1157c 1158c 1159c 1160c 1161c


1125001
1168
1175
1176
1163c
1164c
1165c
1166c
1167c
1169c
ccdA
1171c
1172c
cysD
pcrA
1177c
1178c
1179c
phnA
mtlD
mtlA2
1184c
1150001
1193
1194
1195
1197
tRNA
tRNA
mtlA1
glmS
lepB
1189c
pykF
pfk
dnaE
1196c
rs1
1201c
ilvE
parC
1205c
1206c
fic
1208c
1175001
1211
cpsY
thdF
1209c
parE
1213c
pyrC
ung
1216c
1217c
nylA
1219c
1220c
pyrE
pyrF
pyrDB
pyrK
1226c
deoD
1228c
punA
1230c
1231c
1232c
deoB
rpiA
1200001
1243
1251
1254
1259
1236c
1237c
1238c
pepV
1240c
uvrC
1245c
1246c
eno
1249c
1250c
grk
1253c
1255c
1256c
1257c
1258c
1262c
hisI
hisF
hisA
hisH
1267c
hisB
serB
hisD
1225001
1282
1287
1296
1297
rl31
hisG
hisZ
hisC
1276c
gyrB
1278c
1279c
1280c
1284c
1286c
rl19
1289c
1290c
1291c
1292c
1293c
flaW
add
1299c
1300c
1250001
1310
1314
1323
1301c
adcA
1303c
1304c
1305c
1306c
1307c
aldR
1309c
asnS
aspB
1313c
1315c
1316c
1317c
1319c
1321c
budC
ftsX
ftsE
1275001
rf2
1327c
1329c
1330c
1331c
1332c
sfp
1335c
pksD
1337c
1338c
bacD
bacA2
1341c
1300001
1349
1351
1352
1353
1357
1358
1359
bacA1
1343c
1344c
1345c
bacT
1347c
1348c
1354c
1355c
1356c
1360c
1361c
1363c
1365c
1325001
1368
1369
1374
1378
1379
1380
1387
1388
1390
1366c
1367c
1370c
1372c
1373c
1375c
1377c
leuD
leuC
leuB
leuA
urk
pckA
1391c
1392c
1393c
lepA
1395c
1350001
1398
1399
1410
1411
1419
1420
gbpC
1397c
1400c
1402c
1403c
1404c
1405c
1406c
1407c
1408c
1409c
1412c
1414c
1415c
1416c
1417c
hemN
1375001
murC2
cobQ
pdhC
pdhB
pdhA
pdhD
clpB
1426c
1427c
1428c
1431c
1432c
1434c
1435c
1436c
epsC
1438c
1442c
1443c
1444c
1400001
1449
1450
1445c
1446c
1447c
aldB
alsS
1453c
1454c
mulX
1456c
rmlB
1459c
rmlC
rmlA
1462c
1463c
1464c
1465c
metA
apt
1470c
1471c
recJ
1425001
1479
1480
1487
1473c
1474c
1475c
1476c
miaA
1482c
1483c
1484c
1485c
1486c
1488c
lacX
lacG
lacE
lacF
lacD
lacC
lacB
lacA
lacR
rexA
1450001
glnQ
1520
1521
glnP
rexB
1502c
1504c
1505c
1506c
1507c
1508c
rg9
syfB
1511c
syfA
smc
rnc
covX
covS
covR
1475001
1546
endA
1524c
murA
1526c
atpA
atpB
atpC
atpD
atpE
atpF
atpG
atpH
phsG
glgA
glgD
glgC
glgB
putA
1542c
dnlJ
1545c


1475001
endA 1524c murA 1526c atpA atpB atpC atpD atpE atpF atpG atpH phsG glgA glgD glgC glgB pulA 1542c dnlJ 1545c 1546
1500001
1547c 1548c 1550c 1551c 1555c ampM 1557c 1558c trkB trk pacL glgP malQ malR 1560 malX malF malG 1571 murZ
1525001
metK 1574c 1575c 1576c 1577c dnaX 1582c 1584c 1585c syt1 1587c 1588c 1589c amyA ccpA birA 1579 pepQ
1550001
1593c cah ptcC 1597c ptcA celR ptcB bgl 1604c smpB vacB 1609c 1611c 1612c 1613c fpg 1615c 1616c era dagK 1619c phoH 1621c phnR 1623c 1602 lguL 1605
1575001
rrf1 pyrH ri1 ri11 1628 1629c 1631 pfs 1633c 1634c glmU 1636c 1637c 1638c metS 1641c 1642c 1643c 1644c 1645 1646c 1647c 1648c exoA end3 1651 ogt serA 1654c 1655c serC
1600001
1657c nrgA 1659c 1660c 1661c holB kthY 1664c livF livG livM livH livK 1670c 1671c clpP upp metC metB 1676c murE 1678 1679c 1680c 1681c 1682c 1683c 1685c
1625001
ppaC dltD dltC dltB dltA pflA hlyX 1694c 1695 1697c 1699c 1700c 1701c 1702c 1703c 1704 1705 1706 1707c trkA trkH 1710c rluB 1712c 1713c 1714c 1715c 1716c
1650001
1717c murI 1719c 1721c 1722c 1723c 1724c 1725 1727 greA 1729c 1730c murC 1732c 1733c accA accD accC fabZ 1742c bccP fabF fabG fabD acp
1675001
fabH 1745c 1746c 1747c akh tRNA 23s 5s 16s 1750c 1752c 1753c 1754c 1755c 1757c 1758c 1760c 1761c 1762c 1763c 1764c 1765c 1766c 1768c syv
1700001
tRNA 1771c 1772c 1773c 1774c 1775c 1776c nrdI 1779c 1780 1781 1782 tRNA 23s 5s 16s proS 1784c cdsA uppS 1787c 1788c 1789c 1790c 1791c 1793c 1794c 1795c 1797c
1725001
1798c nadD 1800c 1801c 1802c 1803c 1804c 1805 1806 1807c 1808c scnG scnE scnF 1812 1813 scnK scnR 1816c 1817c 1818c gatB 1820c 1821c gatA pncA 1824c ybhQ 1827
1750001
1828 aspG 1832 1830c recG alr acpS aroG aroH secA manA scrK scrA scrB scrR 1848 nusB 1846c efp comEB pepP uvrA
1775001
1852 1853 1854 1855 1856c rsB ssb rsE 1861c 1862 mutY 1867c trxA mutS2 1871c 1872c mh3 lepC 1875 1876 ptnA ptnC 1879 1881c
1800001
1882c 1883 1884c sys 1888 1889c 1892c 1893c 1894c 1895c 1896c 1897 1898 1899 1900 1902c 1903c 1904c 1905c 1906c 1907 1908c 1909c 1910c 1912c 1913c 1914c comC comD comE dedA sapR2 pgdA
1825001
dnaI dnaB 1923c gcrR 1925c psaR 1927 psaB htpX gidB lemA 1933c 1934c 1935c 1936c cnhA 1938c 1939c 1940c atmB 1942c syI


1945
1946
1950
pepA
proC
1850001
nusG
secE
pbp2a
1951c
groEL
groES
1956c
1957c
1958c
1960c
1961c
1963c
1964c
1965c
1966c
ssb2
1968c
1969c
1970c
1971c
1972c
1975c
1976c
1977c
tyrS
tRNA
23s
1875001
ackA
1979c
1980c
1981c
1982c
comYD
comYC
comYB
comYA
1988c
rpoC
rpoB
pbp1b
adcB
adcC
1995c
ipk
comX1
2027
5s
16s
1900001
1999c
rl17
rpoA
rs11
rs13
2003c
rl1
adk
secY
rl15
rl30
rs5
rl18
rl6
rs8
rs14
rl5
rl24
rl14
rs17
rl29
rl16
rs3
rl22
2026c
sacB
clpC
ctsR
2035
treR
2048
tRNA
1925001
eftS
rs2
2033c
pepD
treA
pttB
dexA
2043c
relA
2046c
ptsG
2049c
2050c
2055
2056
2058
2060
2061
2069
2070
tRNA
1950001
2054c
2057c
2059c
hemZ
2064c
2065c
2066c
csbB
2071c
2072c
2073c
nrdD
2075c
2080
2081
2097
argS
2104
1975001
2076c
2077c
2078c
2079c
2083c
2084c
recA
cinA
tagI
ruvA
hexB
2090c
2091c
2092c
argR
2094c
2096c
2099c
2100c
aspS
hisS
2104a
2105
2109
2115
opuCa
opuCb
opuCc
opuCd
2123
2124
2125
2127
2128
2130
2131
2134
2000001
2106c
2107c
2108c
2111c
gbpA
2113c
2114c
2120c
2121c
2126c
2129c
2133c
2135c
2155
recF
2159
2160
2025001
2136c
2137c
dnaC
2139c
2140c
gidA
rpiB
2143c
2146c
2147c
2148c
2149c
2150c
pgsA
2152c
2153c
2154c
guaB
2158c
tRNA
htrA
2165
2030921
2161c
2162c