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Compilation of DNA sequences of *Escherichia coli* (update 1993)

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ABSTRACT

We have compiled the DNA sequence data for *E.coli* available from the GENBANK and EMBL data libraries and over a period of several years independently from the literature. This is the fifth listing replacing and increasing the former listings substantially. However, in order to save space this printed version contains DNA sequence information only, if they are publically available in electronic form. The complete compilation including a full set of genetic map data and the *E.coli* protein index can be obtained in machine readable form from the EMBL data library (ECD release 15) as a part of the CD-ROM issue of the EMBL sequence database, released and updated every three months. After deletion of all detected overlaps a total of 2 353 635 individual bp is found to be determined till the end of April 1993. This corresponds to a total of 49.87% of the entire *E.coli* chromosome consisting of about 4,720 kbp. This number may actually be higher by 9161 bp derived from other strains of *E.coli*.

INTRODUCTION

Within this sequence supplement issue we were able to publish a compilation of DNA sequences of *Escherichia coli* in four contiguous years since 1989 and asked our colleagues from all over the world for additions and corrections [1–4]. Over the recent years the number of newly published *E.coli* sequence data increased substantially (see Fig. 1). The velocity of adding new data increased also. A rough calculation allows the prediction, that the complete sequence of *E.coli* may be known by 1998, using a noncoordinate effort only. This target may be reached earlier, because at least two groups have devoted their research to systematic sequencing of certain areas of the *E.coli* chromosome. According to our data a total of 2 353 636 bp is sequenced till April 1993. Almost one halve of these nucleotides is published more than once. The data presented here may serve as a basis for encouragement to our colleagues to either send us their unpublished, mostly flanking material or to determine additionally the sometimes very small gaps towards known neighbouring sequences. This may finally help to produce the *Escherichia coli* K12 DNA sequence as the first complete sequence of a living organism. This compilation is available in its full form quarterly from EMBL data library together with their current release on tape (ECD) or from the EMBL file server [5]. It may also be received from the EMBL data library on CD-ROM together with a service stand alone program for quick database search and direct access to collected sequences.

PREVIOUS AND SUPPORTING EFFORTS

The most famous collection of *E.coli* data is the linkage map compiled by B.Bachmann [6]. These data were updated for the last time in 1990 and we tried to follow this update as close as possible. Thus the electronic full version of ECD contains all known genes, except the open reading frames with no genetic function known, but including all recent updates found in the literature. Three other groups [7–13] started a program to fit the DNA sequence data directly onto the physical map compiled by Y.Kohara et al. [14]. We still prefer the genetic map positions rather than the physical map coordinates, since it seems to be more comfortable to find the most important genetic cross references within the Bachman map, directly. However these numbers are often subject to small changes, if a new contig could be formed. In general one may obtain the physical data simply by multiplying the genetic 'map' data by a factor of 47.2. This operation needs to pay attention to a large inversion within the Kohara restriction map, which however is considered in two other cosmidbanks [15,16]. In order to merge our data with those regarding the Kohara map data directly [7–13] we have compared our data with those of K.Rudd (Bethesda,MD) and paid attention to all other collections as far as possible. Thus, we also included the unpublished material available exclusively to us or to K.Rudd. However, these data were given to us for statistical purposes only; for an example see references 17 and 18. The respective information may be available on personal request from the authors named in Listing 1. Additions and corrections of several colleagues are indicated in the main list within the comment column (see Listing 1; for abbreviations see Table 1).

Although the sequence is only semifinished now, a number of refined functional analyses of the sequence data are performed, namely on promoter [19] and terminator structures [20], as well as on ribosomal binding sites [21] and on the distribution of REP sequences [22].

SYSTEMATIC SEQUENCING EFFORTS

1992 the first two reports on systematic sequencing of the *E.coli* chromosome were released [23,24]. According to announcements made on international conferences at Madison, Wisconsin and at Paris dealing with the chromosomal organisation of small genomes, these projects have reached a fairly advanced status, already. One group headed by F.Blattner (Madison,WI) has almost finished the systematic sequencing of about 20% of the genome located between min 80 and 100. This group has performed their sequencing independently from any sequence data known from other laboratories. Thus, their first report was upon 91.4 kb with about 75% sequenced in other laboratories before. A second report from this group increases the size of this contig to 245 kb [25].

Another group is formed by a number of independent laboratories in Japan. They are devoted to systematic sequencing of the area between min 0 and 33. The coordinator is K.Isono (Kobe University). The first reports are released from the laboratory of M.Mizobuchi (Tokyo) [24]. This group uses a completely different strategy by sequencing gaps only. According to a most recent personal communication, the group of Dr Mizobuchi finished a contig of 274 kb spanning the entire area from min 0 to 6.4. Their first report on 111 kb included about 65% sequence data from other laboratories [24]. The other areas finished now contain considerably more new data.

PERFORMED COMPILATION

The general scope of this collection is to allow a compilation of all uncoordinated sequence information to finally end up with a complete *Escherichia coli* nucleotide sequence data bank, including all sequenced mutants. In order to give a visual impression about the availability of sequence information of *E.coli* DNA we include an appropriate figure. This Figure 1 is printed automatically on a high resolution printer and is to scale as far as possible. The extent of the black bars represents the mainly sequenced areas. All sequences with more then 2000 contiguous basepairs are shown. The final print may not give enough resolution, thus the comparison with the main list (Listing 1) is strongly recommended.

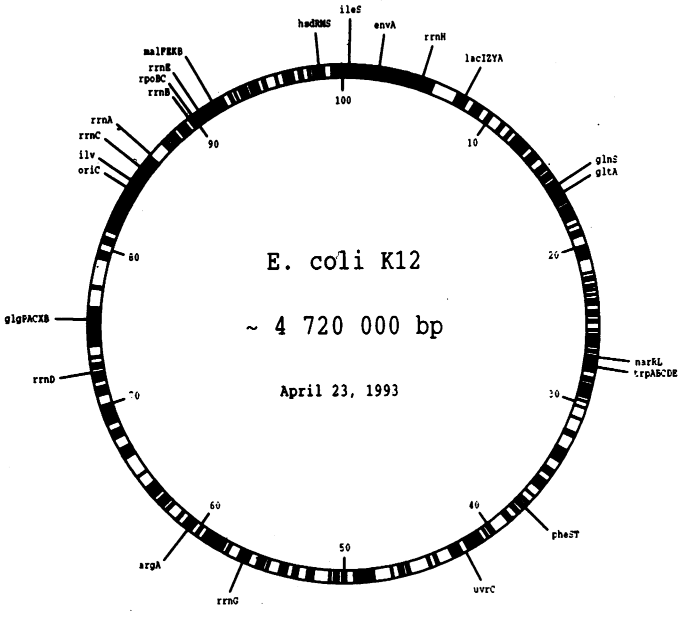

Figure 1. To date sequenced areas within the circular chromosome of *Escherichia coli* K12. The sequenced areas are calculated in percent of the total chromosome according to the main list. All contigs over 2000 bp are shown in scale black bars at the respective genetic map position. Some prominent markers are included as well. The areas between min 0 and 33, and between min 80 and 100 are subject to systematic sequencing efforts in Japan and the U.S.A., respectively (see text).

Besides the pure sequence information some specified additions are introduced, mostly if restriction maps could be found in the original paper. We introduced B.Bachmann's genetic map data completely and used them to sort the sequences roughly by a tenth of a minute. Fine assortment was by a hundredth of a minute, if the sequences overlap. A hundredth of a minute corresponds to 472 bp, which seems to be a sufficient resolution. If the sequences were mapped in either of the compilations using the Kohara map [7–13], we preferred to use their assignment including the respective orientation. However, these numbers may not be used as experimentally determined data, as long as we deal with interrupts of any kind. Contigs are only accepted, if either sequence extends over the respective restriction site.

Note, the given map coordinate may vary somehow within different issues of this collection, due to increasing number of recognized overlaps. If the numbers are not consecutive within collected entries, you may find the missing entries within the electronic ECD data bank only. Numbers higher then 100 within this line refer to DNA sequences, which could not be localized within the chromosome yet. The numbers refer to the following type of information:

101–126	Unlocalized structural genes in alphabetical order
>200	Insertion sequences in quasi numerical order (e.g. 200.05 is IS5; 201.50 is IS150)
>300	tRNAs filed as RNA sequences and unlocalized tRNA genes in alphabetical order of the corresponding amino acids (RNA sequences neglected here)
>400	unlocalized RNAs
>500	reviews and summaries (neglected here)

The gene symbols are either according to the Bachmann list or to the respective paper. Several symbols have been changed in the past for different reasons. In order to provide a basis for comparison, we added Listing 2, which is part of the main list but sorted on names. Note, some names denoted by '*' seem to be biased. Thus the given entry names within the EMBL or GenBank entries differ sometimes from the given gene symbol. These differences are indicated as much as possible mostly using the '=' symbol in the last position of the name column pointing to the comment column. If more then two gene symbols are necessary to describe the content either of a single or a condensed entry, the '&' symbol points to the comment column, in order to indicate that this area consists of more than two genes. Thus the two columns should be read as one consecutive item. We tried to use each gene symbol at least once in the first position. Since a fairly compressed form had to be used within this databank, some terms and abbreviations had to be used and are explained in Table 1.

This fourth edition of ECD contains a major increase of information by adding the exact coordinates for the performed overlaps, the entire genetic map data [6] and the 2D-protein index numbers [26]. In order to make the calculations transparent, we preferred to keep all references with contributions to the respective area. However, we can only give one reference per data bank entry in this printed version. The full set of information is provided in the electronic ECD version, which also includes some structural information and other functional data, restriction map data, corrections or sequenced mutations. Most tRNA sequences are compiled together with their respective anticodon sequence. For crossreferences to the tRNA collection [27] see our previous listing [1]. Most ribosomal operons are not fully sequenced within their 16S and 23S RNA genes. Thus the compiled sequences are sometimes only analogs. Insertion sequences are compiled using the known copy number within *E.coli* K12 strain W3110 [28,29]. Only those insertion elements which are sequenced together with flanking areas may be found at the respective genetic locus.

Strains other then *E.coli* K12 are indicated. However, the respective sequence data are not included in the final calculation. Names not found within the Bachmann list or not genetically defined within the original paper are abbreviated but explained with the full name. Undetermined or open reading frames (urf or orf) are indicated mostly according to the original paper and the resulting protein size. Regions with no specific genetic function are marked as intergenic or flanking regions. Some reviews on the genetic or functional structure as well as on cosmid banks are included, but neglected in this printed version.

The accession number column gives the first accession number for any EMBL entry. This number remains constantly with the quoted nucleotide sequence. It is therefore the most important cross reference. According to the general databank policies the accession number will even be part of any condensed entry after removing overlaps. Thus an EMBL EC entry may be found via different accession numbers, but each accession number points to one individual EC entry only. If the EMBL-accession number differs from the GenBank accession number, the GenBank accession number is given in the comment column. Published sequences, which are not yet included into EMBL databank are now added and received internal accession numbers either from K.Rudd's [8] or our own collection. Unpublished material still not publically available, may be obtained directly from those individuals, who are named in the comment column (see Listing 1).

The EMBL column gives the EMBL entry name for the given reference, usually beginning with the identification EC...... The respective GenBank entry name usually begins with ECO....., and is given in the respective column. This may be used to find *Escherichia coli* sequences directly either within the EMBL databank or GenBank. However, this identification may also point to plasmid borne and other sequences (for a list of these entries see our previous listing [1]).

Note, that the EC or ECO entry name may have been changed between different database releases, especially due to compressing overlapping sequences or to changing preliminary names (usually the respective accession number). Numbers in brackets after the name point to the position of this reference within the list of references of the respective GenBank/EMBL entry. Incorporation of these numbers is still incomplete. In order not to depend on these changes the respective invariant accession number is always given in the accession number column.

There are five columns giving different types of numbers of basepairs:

1) The basepair ('bp') column gives the number of basepairs found in the reference quoted. The number is mostly consistent with the respective number given in the EMBL or GenBank entry. If it is clear from the original text, that the given sequence information is used as illustration only and not originally determined here, the entry within this column is 0. If the text allows to complete restriction sites the flanking nucleotides are added, or if it allows to recognize vector sequences, these sequences are omitted. Thus the given number may differ from the EMBL or GenBank entry. This is mostly indicated in the comment column.

2) The 'offset' column is a control number for ascending order in the map column and describes the number of nucleotides collected up to the previous entry. This column is deleted in the printed version now.

3) The 'from' column defines the address number of the nucleotide to begin with in the respective collection.

4) The 'to' column defines the respective nucleotides to terminate the respective collection. If the *from* number is higher then the *to* number our program automatically inverses the sequence.

5) The total column gives the number of basepairs added to a total number after deletion of all repeats and overlaps from different entries. This number is given only once per added area in the first entry after a sort by the genetic map position. Data from strains other than *E.coli* K12 are ignored in this calculation. If there is no overlap to other entries the numbers given in the bp and total column are identical. Adding up all entries in this column we arrive at the actual number of sequenced basepairs of the entire *E.coli* genome. The actual number of total basepairs sequenced up to April 1993 is 2 353 635 bp = 49.87%

In order to distinguish between the different entries, e.g. for this printed version of the data base, an additional one letter column (*) is included as well. **T** defines the start of a completely collectable entry. **P** defines the start of an entry only partially collectable. **F** defines an entry missing in the EMBL data base. **C** defines any collectable entry other then the starting one. **B**, **J**, **U**, and **W** define entries from strains other then *E.coli* K12.

The article column line gives the references for the quoted sequence information in a fairly condensed format and indicates the volume and first page of each entry, only. The appropriate year is added in a special year column to allow the calculation of an annual index given in Table 2. A list of abbreviations for the respective journals is given in Table 3.

The gene-protein database of *Escherichia coli* (Edition 5) of VanBogelen et al. [26] is included in a separate column. Only very few proteins addressed in the 2D gels are not found in the genetic map. Note, the full information is again given in the electronic version only.

DATA DISTRIBUTION IN MACHINE READABLE FORM

This compilation is available as a flat file (ECD) from the EMBL data library [4] and is automatically distributed with the each release the EMBL data library. In addition, this compilation is available together with a stand alone service program on the CD-ROM version of the EMBL data library. This CD-ROM is produced in cooperation with IRL-Press and contains the other collections of this supplement issue, too. However our version may also be available on disk on request from Gieβen; email address KROEGER@EMBL-HEIDELBERG.DE. Using our service program one may assemble the entire nucleotide sequence directly from the CD-ROM or may extract each single or collected entry individually.

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Table 1. Databank cross references and abbreviations. Some differences between the two databases or repeated entries, as well as accession numbers given in most recent papers are indicated directly

Gb	points to a difference mostly in the accession number between GenBank and EMBL databanks [see also AC line].
GbNew	is introduced, if the actual issue of GenBank data bank may not contain this more recent entry. However, caused by a certain difference in updating these entries, they may already be incorporated into the most actual GenBank version. They are always available using the EMBL/GenBank file server.
KR	indicates entries primarily found by K. Rudd [3]
BB	acknowledges the contribution of Bobby Baum, 6607 Pyle Road, Bethesda, Maryland 20817, USA. Entries marked by BB are added [new] or corrected [length, map location, overlap] using a listing compiled by Bobby Baum. His collection may be available as Ec.lis file via the National Biomedical Research Foundation (USA).
RVB	[Ruth VanBogelen]
MK	[Manfred Kröger] and
HD	[Peter Rice or other colleagues at EMBL] point to unresolved differences to the databases found by these individuals.
char	characterization of genetic elements
comp	comparison with other organisms
corr	correction of published data
func	functional description
gap	small undetermined gaps
gene map	genes not sequenced till now
map	restriction or genetic map data
mut	sequenced mutations
prom	characterized promoter sequences
regul	characterized regulatory sequences
summ	summation or review
unpub	unpublished material quoted in the respective article or in either of the databases referred to

Table 2. Annual growing of the *E.coli* DNA-sequence information. This table compiles all published sequence information according to the annual growth in number of publications (entries) and nucleotides given therein. The final number for total information (bp) exceeds the actual number of sequenced nucleotides (2 353 635 bp) roughly by one third

Year	annual entries	total entries	annual information (bp)	total information (bp)
1967	1	1	600	600
1968	2	3	205	805
1969	4	7	349	1154
1970	3	10	249	1403
1971	10	20	841	2244
1972	5	25	426	2670
1973	6	31	434	3104
1974	4	35	205	3309
1975	9	44	820	4129
1976	7	51	530	4659
1977	9	60	1116	5775
1978	22	82	6911	12686
1979	43	125	20122	32808
1980	56	180	36312	68934
1981	72	252	101793	170727
1982	95	347	83314	254041
1983	135	482	131952	385993
1984	141	623	178748	564741
1985	167	790	163921	728662
1986	176	966	248308	976970
1987	150	1116	204359	1181329
1988	186	1302	248615	1429944
1989	206	1508	291660	1721604
1990	205	1713	327797	2049401
1991	244	1957	402797	2452198
1992	277	2234	617365	3069563
1993	96	2330	479262	3548825

Table 3. List of abbreviations for journals

ABB	Archives of Biochemistry and Biophysics
AcMB	Archives of Microbiology
AdER	Advances in Enzyme Regulation
AgrB	Agricultural Biochemistry (Tokyo)
AEMb	Applied Enviromental Microbiology
AInP	Annales Institute Pasteur Microbiologie
AMbP	Acta Microbiologica Polonica
AnMi	Annales of Microbiology
ANYA	Annales of New York Academy of Science
BBA	Biochemica Biophysica Acta
BBRC	Biochemical Biophysical Research Communications
BChF	Biochemie (France)
BCHS	Biological Chemistry Hoppe Seyler's
BiCh	Biochemistry (USA)
BInt	Biochemistry International
BioE	BioEngineering – Forschung und Praxis (VAAM-Germany)
Bioo	Bioorganic Chemistry (UdSSR)
BiRp	Bioscience Report
BJ	Biochemical Journal (UK)
CJMi	Canadian Journal of Microbiology
CRC	Carlsberg Research Communication
CSHQ	Cold Spring Harbour Symposium of Quantitave Biology
Cell	Cell
DANs	Doklady Akademia Nauk (UdSSR)
DNA	DNA
DNAS	DNA Sequence – Journal of DNA Sequencing and Mapping
EJB	European Journal of Biochemistry
Elph	Electrophoresis
EMBO	EMBO Journal
FEBS	FEBS Letters
FedP	Federation Proceedings
G	Genetics
GAnT	Gene Analysis Techniques
GeDV	Genes and Development
Gene	Gene
Geno	Genomics
GlyB	Glycobiology
JBCh	Journal of Biological Chemistry
JBac	Journal of Bacteriology
JBio	Journal of Biochemistry (Japan)
JBSc	Journal of Biological Sciences
JCBc	Journal of Cellular Biochemistry
JGMi	Journal of General Microbiology
JJGe	Japanese Journal of Genetics
JMAG	Journal of Molecular and Applied Genetics
JMB	Journal of Molecular Biology
MBE	Molecular Biology and Evolution
MGG	Molecular General Genetics
MoMB	Molecular Microbiology
MuRs	Mutation Research
N	Nature
NBio	New Biology
NAR	Nucleic Acids Research
NNB	Nature New Biology
PNAS	Proceedings of the National Academy of Science (USA)
Prot	PROTEINS: Structure, Function and Genetics
PSDA	Protein Sequence Data Analysis
PRSB	Proceedings of the Royal Society B; Biol. Sciences
Scie	Science
Unpub.	unpublished material quoted in the databanks or quoted in the collection of K.Rudd (not yet available)
ZNfC	Zeitschrift für Naturforschung Part C (Biological Sciences)

Listing 1: Main list sorted on map position

map	name	comment	protein	bp	*	from	to	total	journal	vol	page	year	EMBL	AccNr	GenBank
0.01	thrA	operator new BB		349	T	1	123	129425	JBCh	257	3896	1982	ECTHRPRO	X68872	-
0.02	thrA	-		2463	C	1	196	0	PNAS	77	5730	1980	ECTHR	J01706	ECOTHR
0.03	thrABC	-		208	C	0	0	0	PNAS	76	1706	1979	ECTHR	J01706	ECOTHR
0.04	0-2.4 min	Japan-EC genome project		111402	C	1	19058	0	NAR	20	3305	1992	ECAPAH01	D10483	ECOMORI
0.22	htgA,orf	5 open reading frames		3171	C	0	0	0	DNAS	0	0	1992	ECHTGA	X67700	-
0.24	dnaK	E.coli B comparison		2141	B	0	0	0	JBac	174	3715	1992	ECDNAKB	D10765	-
0.25	dnaKJ	promoter corr BB		182	C	0	0	0	PNAS	82	2679	1985	ECDNAKA	M10420	ECODNAKA
0.26	dnaK	corr BB	B066.0	1920	C	0	0	0	PNAS	81	848	1984	ECDNAK	K01298	ECODNAK
0.27	dnaKJ	mut corr BB		1623	C	0	0	0	JBCh	261	1778	1986	ECDNAJK	M12544	ECODNAJK
0.30	IS186A	location A		1336	C	0	0	0	FEBS	192	47	1985	IS186	X03123	INS186ECB
0.31	gef	cell killing new KR		780	C	0	0	0	MoMB	3	1463	1989	ECGEFGENE	X17311	ECOGEFGENE
0.46	ant	KR		1349	C	0	0	0	JBCh	263	10408	1988	ECANTAPA	J03879	ECOANTAPA
0.49	nhaR	correction of 28Kd		270	C	1	18	0	JBCh	267	10433	1992	--NHAR	0036MK	-
0.50	0-2.4 min	14 bp to be deleted		0	C	19090	111402	0	NAR	20	3305	1992	ECAPAH01	D10483	ECOMORI
0.51	rpsT S20	-		2881	C	0	0	0	NAR	14	6965	1986	ECRPSTB	V00345	ECORPST
0.53	rpsT S20	also ECORPSTB		1806	C	0	0	0	JBCh	260	5616	1985	ECRPSTA	M10428	ECORPSTA
0.54	ileS	part. aa-sequence only		2073	C	0	0	0	Scie	226	1315	1984	--ILES	0018MK	-
0.59	lspA	corr BB		1138	C	0	0	0	FEBS	173	264	1984	ECLIPEP	X00776	ECOLSPA
0.61	lsp,orf	orf 149,316,304,dapB		2696	C	0	0	0	NAR	19	180	1991	ECLSPDAP	X54945	ECOLSPDAP
0.62	dapB	-		1281	C	0	0	0	JBCh	259	14829	1984	ECDAPB	M10611	ECODAPB
0.63	carA	-	G041.4	5227	C	0	0	0	PNAS	81	4139	1984	ECCARAB	J01597	ECOCARAB
0.96	kefC	& apaGH,ksgA,pdxA,surA		2253	C	0	0	0	MoMB	5	607	1991	ECKEFC	X56742	ECOKEFC
1.10	apaH	-		2396	C	0	0	0	MGG	205	515	1986	ECAPAH	X04711	ECOAPAH
1.11	apaG	-		1200	C	0	0	0	NAR	8	2255	1980	ECFOLA	J01609	ECOFOLA
1.13	pdxA	orf1 = surA acc. 0.96		1469	C	0	0	0	JBac	171	4767	1989	--PDXA	0019MK	-
1.15	surA	M.Almiron/R.Kolter		1666	C	0	0	0	Unpub.		K.Rudd	1991	-	ES3143	surAeco
1.43	polII	131 differences		4081	C	0	0	0	MGG	226	24	1991	ECPOLB	X54847	ECOPOLD
1.45	polB	= dinA MK		4666	C	0	0	0	NAR	18	7185	1990	ECPOLBDA	M35371	ECOPOLBDA
1.49	araA	E.coli B 2D:araA	G054.1	4478	C	0	0	0	Gene	47	231	1986	ECARAABD	M15263	ECOARAABD
1.52	araBC	E.coli B J01641 in Gb		175	C	0	0	0	PNAS	78	752	1981	ECARACZ	V00257	ECOARABOP
1.58	araC	E.coli B J01641 in Gb		1162	C	0	0	0	NAR	8	5267	1980	ECARAC	V00256	ECOARABOP
1.59	araCBAD	corr BB		1172	C	0	0	0	JMB	154	649	1982	ECARAX	V00259	ECOARACK
1.83	leuA	-		306	C	0	0	0	JMB	149	579	1981	ECLEUA	J01642	ECOLEUA
1.84	leuP	overlap HD,BB		855	C	0	0	0	JBac	166	1113	1986	ECLEUP	M12891	ECOLEUP
1.85	leuO	analog to lysR		960	C	0	0	0	PNAS	85	6602	1988	ECLYSR	M21150	ECOLEUO
1.86	ilvI	-		2323	C	0	0	0	NAR	11	5299	1983	ECILVIH	X01609	ECOILVIH
1.87	ilvH	-		389	C	0	0	0	JBac	163	186	1985	ECILVIHP	M10738	ECOILVIHP
1.88	shl	next to orfB, Hind3 id?		1820	C	0	0	0	JBac	172	4696	1990	ECSHL	M35034	ECOSHL
1.96	orfB	next to shl, Hind3 id ?		1500	T	0	0	0	NAR	18	2813	1990	ECPBPBRR	X52063	ECOPBPBRR
2.04	pbpB	= ftsI		2759	C	0	0	0	MGG	191	1	1983	ECPBPB	K00137	ECOPBPB
2.07	murF	-		1656	C	0	0	0	CJMi	35	1051	1989	EC2MIN	X55034	ECO2MIN
2.08	murF	-		1491	C	0	0	0	NAR	17	5379	1989	ECMURF	X15432	ECOMURF
2.11	mraY	mraY = orfY		2608	C	0	0	0	NAR	18	1058	1990	ECMUROY	X51584	ECOMUROY
2.12	murD	corr in ECMURD okay		1629	C	0	0	0	NAR	18	183	1990	ECMURD	X17609	ECOMURD
2.13	ftsW	-		1497	C	0	0	0	JBac	171	6375	1989	ECFTSW	M30807	ECOFTSW
2.15	murC	-		2745	C	0	0	0	NAR	18	4014	1990	ECMURGC	X52644	ECOMURGC
2.16	ddl	-		1152	C	0	0	0	JBac	167	809	1986	ECDDLFTS	M14029	ECODDLFTS
2.17	ftsQ	-		2490	C	0	0	0	JMB	184	399	1985	ECFTSQA	X02821	ECOFTSQAZ
2.26	ftsZ	= sulB,sfiB corr BB		1870	C	0	0	0	Gene	36	241	1985	ECFTSQAB	M10429	ECOFTSQAB
2.29	envA	-		2048	C	0	0	0	JBac	169	5408	1987	ECENVAA	M19211	ECOENVAA
2.30	secA	-		3811	C	0	0	0	JBac	170	3404	1988	ECSECA	M20791	ECOSECA
2.31	mutT	wrong BB		867	C	0	0	0	MGG	206	9	1987	ECMUTT	X04831	ECOMUTT
2.40	2.4 - 4.2	min region K.Mizobuchi		82680	C	0	0	30280	Unpub.			1993	-	-	-
2.41	intergenic	region K.Mizobuchi		2000	C	1	2000	0	Unpub.			1992	-	-	-
2.70	guaC	X07917 identical new BB		1991	C	1	1991	0	BJ	255	35	1988	ECQUAC	M33020	ECOGUAC
2.80	nadC	K.Mizobuchi		3607	C	1	2380	0	Unpub.			1992	-	-	-
2.90	ampD	& aceEF,lpd		1983	C	1	1844	0	MoMB	3	1091	1989	ECAMPDE	X15237	ECOAMPDE

2.92	aroP	-		1440	C	1440	1	0	NAR	18	653	1990	ECAROP	X17333	ECOAROP
2.93	aroP	-		585	C	508	1	0	JBac	169	386	1987	ECAROPRA	M15312	ECOAROPRA
2.95	aceF	-	C070.0	2040	C	188	7740	0	EJB	133	481	1983	ECACEX	V01498	ECOACE
3.00	speE	prom		820	T	1	2792	2792	JBac	171	4457	1989	ECSPDE	J02804	ECOSPDE
3.01	speE	corr BB		1882	C	0	0	0	JBCh	262	16037	1987	ECSPDE	J02804	ECOSPDE
3.10	gcd	glucose dehydrogenase		2634	T	1	2634	2634	JBac	172	6308	1990	ECGLDE	X51323	ECOGCD
3.30	panB	-		1716	T	1	1716	1716	JBac	175	2125	1993	ECPANBG	X65538	-
3.50	folK	HPPK		993	T	993	217	4849	JBac	174	5971	1992	-	-	-
3.51	pcnB	bad ref Em bad ref Gb		1542	C	1542	1	0	JBac	171	1254	1989	ECPCNB	M20574	ECOPCNB
3.53	intergenic	region		946	C	753	1	0	Unpub.			1992	ECDKSAPCN	X64595	ECODKSAPCN
3.54	dksA	-		1273	C	1273	601	0	JBac	172	2055	1990	ECDKSA	M34945	ECODKSA
3.55	sfs1	id. to orf1, correction		1230	C	1104	1	0	JBac	173	2644	1991	ECSFS1A	M60726	ECOSFS1A
3.60	mrcB	= ponB		2758	T	1	2757	10774	EJB	147	437	1985	ECPONB	X02163	ECOPONB
3.61	fhuACD	-		1900	C	470	4607	0	JBac	169	3844	1987	ECFHUA	M12486	ECOFHUACD
3.64	fhuB	overlap BB		2563	C	264	2222	0	MGG	204	435	1986	ECFHUB	X04319	ECOFHUB
3.65	popC = GSA	-		1920	C	1	1920	0	MGG	225	1	1991	ECGSAG	X53696	ECOGSAG
3.81	dgt,orf	dGTP hydrolase		2760	T	1	2514	0	PNAS	87	2740	1990	ECDGTP	M31772	ECODGTP
3.83	htrA	loc BB		1855	C	1	1855	0	NAR	16	10053	1988	ECHTRA	X12457	ECOHTRA
4.10	dapD	-		1182	T	1	1182	1182	JBCh	259	14824	1984	ECDAPD	K02970	ECODAPD
4.15	map	& rpsB,tsf overlap BB	F029.7	1197	T	1197	1	6296	JBac	169	751	1987	ECMAP	M15106	ECOMAP
4.17	tsf	J01684 in Gb	C030.7	2191	C	135	1799	0	NAR	9	4163	1981	ECRPSB	V00343	ECORPSB
4.18	smbA	-		2277	C	1	1405	0	JBac	174	7517	1992	ECD13334	D13334	-
4.20	4.2 - 6.2	min region K.Mizobuchi		86115	C	0	0	45301	Unpub.			1993	-	-	-
4.22	RRF	-		831	C	1	831	0	JBCh	264	20054	1989	ECRRFX	J05113	ECORRFX
4.35	cds	-		1259	T	1	1259	1259	JBCh	260	12078	1985	ECCDS	M11330	ECOCDS
4.40	ompH =hlpA	identical to skp ?		779	T	1	500	9618	JBac	173	1223	1991	--OMPH	0022MK	-
4.41	firA	overlap with skp Ec.B		1459	C	1	1359	0	JBac	173	334	1991	ECFIRA	X54797	ECOFIRA
4.46	lpxB	& polC = dnaE		1522	C	1	6627	0	JBac	169	5727	1987	ECLPXA	M18265	ECOLPXA
4.49	accA,dnaE	dnaE = polC conflict		1539	C	409	1539	0	JBCh	267	16841	1992	ECPOLCACC	M96394	ECOPOLCACC
4.80	proS =drpA	MK also X55518		2795	T	2795	1	2795	N	347	203	1990	ECPROS	M97858	ECOPROS
4.90	rcsF, orf	231 kbp Kohara map		1435	T	1	1435	1435	JBac	174	8016	1992	ECRCSF	L04474	ECORCSF
5.10	rrnH regul	fis sites I, II & III		92	T	1	8	9425	EMBO	11	4175	1992	ECRRNHUP	X67217	ECORRNHUP
5.11	rrnH	operon incl. analogs		478	C	1	431	0	Cell	17	225	1979	ECRGNX1	J01700	ECORGNX1
5.12	rrsH 16S	analog J01695 in Gb		1441	C	1519	2100	0	JMB	148	107	1981	ECRRNBZ	V00348	ECORGNB
5.13	rrlH,rrfH	-		4481	C	1	4481	0	Unpub.			1992	ECD12649	D12649	ECOD12649
5.20	aspV,orf	orf267,304,259,207		3929	C	7	3929	0	Unpub.			1992	ECD12650	D12650	ECOD12650
5.30	mutD =dnaQ	-		1592	T	1	1592	1592	JMB	190	113	1986	ECMUTD	X04027	ECOMUTD
5.72	pepD	-		2325	T	2311	229	8709	JBac	172	4641	1990	ECPEPD01	M34034	ECOPEPD
5.78	gpt	-		2253	C	1	2253	0	Gene	32	243	1984	ECGPTA	M13422	ECOGPTA
5.82	phoE	J01662 in Gb		1980	C	1873	542	0	JMB	163	513	1983	ECPHOE	V00316	ECOPHOF
5.83	proA	mut		3041	C	1	3041	0	NAR	12	6337	1984	ECPROAB	X00786	ECOPHOEA
6.50	argF	-		300	T	1	300	1405	EMBO	1	853	1982	ECARGFPR	M24185	ECOARGFPRM
6.51	argF	X00759 in Gb		310	C	261	310	0	Gene	16	119	1981	ECARGF	V00260	ECOARGF
6.52	argF	-		1183	C	129	1183	0	NAR	12	6277	1984	ECARGF01	X00759	ECOARGF
6.88	IS3A	flanking sequences		1032	T	1	1032	1032	Unpub.			1993	ECIS3A1	D12594	-
7.50	betT, orf	-		7412	T	1	7412	7864	MoMB	5	1049	1991	ECBET	X52905	ECOBET
7.53	betA	not printed here M35858		2425	C	1974	2425	0	Gene	103	45	1991	ECBETA	M77738	ECOBETA
7.85	cynR	regulator of cyn genes		1348	T	1348	104	10193	JBac	174	3645	1992	ECCYNR	M93053	-
7.86	cynTSX	& lacAYZI		2633	C	1	1429	0	JBCh	263	14769	1988	ECCYNOPRN	M23219	ECOCYNOPRN
7.93	lacZ	-		147	C	7474	1	0	Scie	187	27	1975	ECLAC	J01636	ECOLAC
7.97	lacI	sequence 5'to promoter		45	C	1	45	0	Gene	48	119	1986	--LACI3	0007MK	-
8.20	hemB	-		1907	T	1	1907	2082	Gene	75	177	1989	M24488	M24488	M24488
8.22	hemB	acc. to K.Rudd (X17417)		175	C	1	175	0	JBac	173	94	1991	-	ES3042	hemBeco
8.45	IS3B	flanking sequences		472	T	1	472	472	Unpub.			1993	ECIS3B	D12595	-
8.50	sbmA	near phoA		1992	T	1	1992	1992	Unpub.			1991	ECSBMA	X54153	ECOSBMA
8.60	ddlA	second ddl gene locus		1687	T	1	1687	1687	BiCh	30	1673	1991	ECDDLA	M58467	ECODDLA
8.70	phoA	-		2715	T	1	2715	2715	Gene	44	121	1986	ECPHOAA	M13345	ECOPHOAA
8.85	proC	announced unpublished		225	P	1	225	1193	NAR	10	7701	1982	unpub	unpub	unpub
8.86	proC	-		968	C	1	968	0	NAR	10	7701	1982	ECPROC	J01665	ECOPROC
8.90	aroL	-		810	T	1	810	2077	BJ	237	427	1986	ECAROL	X04064	ECOAROL
8.91	aroM	-		2021	C	755	2021	0	JBac	165	233	1986	ECAROLM	M13045	ECOAROLM

Listing 1: (*continued*)

9.00	orf,araJ	-		4355	T	4355	2688	9532	JBac	173	7765	1991	ECARAJ	M64787	ECOARAJ
9.03	sbcC	-		5125	C	5125	200	0	NAR	17	8033	1989	ECSBCC	X15981	ECOSBCC
9.05	phoB	-		976	C	1	966	0	JMB	190	37	1986	ECPHOB	X04026	ECOPHOB
9.06	phoR	-		1972	C	1	1972	0	JMB	192	549	1986	ECPHORG	X04704	ECOPHORG
9.10	malZ	-		2345	T	1	2345	10236	JBCh	266	19450	1991	ECMALZ	X59839	ECOMALZ
9.12	queA	1111 bp more than paper		3013	C	1488	3013	0	JBac	173	2256	1991	ECQBIO	M37702	ECOQBIO
9.13	tgt	second part of contig		1823	C	181	1823	0	JBac	173	2256	1991	ECTGT	M63939	ECOTGT
9.16	secD	-		4435	C	1188	4435	0	EMBO	9	3209	1990	ECSECDF	X56175	ECOSECDF
9.18	orf6,tsx	joining two StuI cuts		6	C	0	0	0	JBac	174	1709	1992	map	map	map
9.19	tsx	-		1477	C	1474	1	0	Gene	96	59	1990	ECTSX	M57685	ECOTSX
9.50	ispA	-		1452	T	1	1452	1452	JBio	108	995	1990	ECISPA	D00694	ECOISPA
9.55	pgpA	length BB		704	T	7	711	705	JBac	170	5110	1988	M23546	M23546	M23546
9.80	cyoABCDE	-		5813	T	1	5813	5813	JBCh	265	11185	1990	ECCYOA	J05492	ECOCYOA
9.90	bolA	last 84 bp IS10 sequenc		1597	T	1	893	7719	EMBO	8	3923	1989	ECBOLA	X17642	ECOBOLA
9.92	tig	trigger factor KR	B050.3	1809	C	1	1352	0	JBac	172	5555	1990	ECTIG	M34066	ECOTIG
9.93	clpP	-	F021.5	1236	C	1	1236	0	JBCh	265	12536	1990	ECCLPPA	J05534	ECOCLPPA
9.94	clpX	W.Clark/S.Gottesman		903	C	1	903	0	Unpub.		K.Rudd	1991	-	ES3012	clpXeco
9.95	lon	contains vector sequenc	H094.1	2812	C	1	6	0	Bioo	14	408	1988	ECLONA	M38347	ECOLONA
9.97	lon	-	H094.0	3002	C	1	3002	0	JBCh	263	11718	1988	ECLON	J03896	ECOLON
10.01	HU-1(hupB)	-		460	C	134	460	0	MGG	201	360	1985	ECHUPB	X16540	ECOHUPB
10.20	ffs =	4.5 S RNA		764	T	1	764	764	JMB	178	509	1984	ECRNA45	X01074	ECOSGK
10.30	tesB	-		1455	T	1	1455	1455	JBCh	266	11044	1991	ECTESB	M63308	ECOTESB
10.40	nusB	-	H013.8	683	T	1	683	683	NAR	12	4987	1984	ECNUSB1	X00681	ECONUSB
10.70	priC	also D13958		1225	T	1	1225	1225	JBCh	266	13988	1991	ECPRIC	D00727	ECOPRIC
10.80	apt,dnaX &	orf12,recR,hptG,adk		0	T	1	6819	9848	JBac	172	6042	1990	ECAPTADK	M38777	ECOAPTADK
10.90	visA,adk	2D:adk	F026.0	1867	C	547	1867	0	JMB	219	393	1991	ECADKVIS	D90259	ECOADKVIS
10.92	orf203,312	-		1708	C	1868	3575	0	Unpub.			1991	ECADKVIS	D90259	ECOADKVIS
11.30	ushA	-		1819	T	1	1819	1819	NAR	14	4325	1986	ECUSHA	X03895	ECOUSHA
11.45	rhsD	segment replacing rhsD		300	T	1	300	300	NAR	19	7177	1991	ECRHSDRS	X60997	ECORHSDRS
11.50	rhsD	without replacement		4846	T	1	4846	4846	NAR	19	7177	1990	ECRHSDG	X60999	ECORHSDG
11.60	gcl,orf258	glyoxylate carboligase		2762	T	1	2762	2762	JBCh	268	3911	1993	-	L03845	-
11.90	ads (folD)	-		1769	T	1	1769	1769	Unpub.			1992	ECADS	D10588	ECOADS
11.91	folD	cyclohydrolase		1044	T	1	1044	0	JBCh	266	23953	1991	ECFOLD	M74789	ECOFOLD
12.00	purE	-		2449	T	1	2449	2449	JBac	171	198	1989	ECPURE01	M19657	ECOPUREK
12.20	ppiB	prolyl isomerase		949	T	949	398	2746	BiCh	30	3041	1991	ECAPPIB	M55430	ECOAPPIB
12.23	cysS	-		2194	C	1	2194	0	NAR	19	265	1991	ECCYSSG	X56234	ECOCYSSG
12.30	orf, dnaY	cryptic prophage qsr'		2520	T	1	967	5048	MGG	220	325	1990	ECINTY	X51662	-
12.34	argU,IS3	cr.phage = M27155 in Gb		2269	C	2269	244	0	JBac	171	6197	1989	ECINTD01	M31074	ECOINTDLP
12.35	IS3C	location C		1258	C	1	1258	0	NAR	13	2127	1985	ECIS3	X02311	INS3
12.37	mvrC	membrane protein		1002	C	206	1002	0	NAR	20	3159	1992	ECMVRC	M62732	ECOMVRC
12.60	PA-2 lc	eqivalent to crypt.phag		1060	T	1	1060	4017	JBCh	261	12723	1986	STPA2LC	J02580	PA2LC
12.61	nmpC	-		1303	C	1	1472	0	JBCh	261	12723	1986	ECEPNMPC	M13457	ECOEPNMPC
12.63	IS5B	location B		1195	C	1195	1	0	N	297	159	1982	IS5LAM	J01735	INS5LAM
12.64	PA-2 RZ	equiv. to cryptic phage		290	C	2527	2816	0	JBCh	261	12723	1986	STPA2LC	J02580	PA2LC
12.65	mureine	hydrolase (lysozyme)		1000	F	1	1000	1000	BioE	9	S100	1993	-	-	-
12.75	ecos2	lambda terminase site		690	T	1	690	690	NAR	20	3357	1992	ECS2G	D00928	ECOS2G
12.80	M5 protein	ompT;E.coli JM83		753	T	0	0	3323	NAR	15	3924	1987	ECM5	Y00138	ECOM5
12.81	appY = M5	-		1874	C	1	1296	0	JBac	171	1683	1989	ECAPPYAA	M24530	ECOAPPYAA
12.82	ompT	poor overlay by EcoRI*?		2035	C	2027	1	0	NAR	16	1209	1988	ECOMPT1	X06903	ECOOMPT1
12.90	envY	next to ompT		945	T	1	945	945	NAR	17	800	1989	ECENVY	X13548	ECOENVY
13.00	pheP	phe transport		2256	T	1	2256	2256	JBac	173	3622	1991	ECPHEPA	M58000	ECOPHEPA
13.10	gsk	-		1756	T	1	1756	1756	Unpub.			1992	ECGSK	D00798	ECOGSK
13.30	bent 104	no neighboring gene		279	T	1	279	279	MGG	226	367	1991	ECBENT104	X63981	ECOBENT104
13.40	IS186B	location B		1341	T	1	1341	24622	FEBS	192	47	1985	IS186ECO	M11300	INS186ECO
13.41	entD	new BB		943	C	941	1	0	MoMB	3	757	1989	ECENTD	X17426	ECOENTD
13.43	fepA	-		2624	C	2469	272	0	JBCh	261	10797	1986	ECFEPAA	M13748	ECOFEPAA
13.44	fepA	promoter structure		1997	C	231	1997	0	JBCh	263	18857	1988	ECFE6	J04216	ECOFE6
13.47	entF	ATGA; first 3 nc wrong		4753	C	497	4756	0	BiCh	30	2916	1991	ECENTF	M60177	ECOENTF
13.48	fepE	M.McIntosh		813	C	1	813	0	Unpub.		K.Rudd	1991	-	ES3030	fepEeco
13.49	fepC	-		2961	C	2961	1	0	MoMB	5	1415	1991	ECFEPCDG	X57471	ECOFEPCDG
13.52	p43	-		1391	C	113	1391	0	MoMB	5	1415	1991	ECP43MP	X57470	ECOP43MP

13.54	fepB	-		2177	C	1350	1	0	JBac	171	5443	1989	ECFEPB	M29730	ECOFEPB
13.55	entC	-		1659	C	419	1543	0	JBac	171	775	1989	M24142	M24142	M24142
13.57	entE	also X15058 new BB		1655	C	1	1655	0	FEMS	59	15	1989	M27490	M27490	M27490
13.58	entB	-		3249	C	458	2136	0	JBac	171	791	1989	M24148	M24148	M24148
13.61	cstA	carbon starvation, orf		3253	C	1	3253	0	JMB	218	129	1991	ECCASTGE	X52904	ECOCASTGE
14.30	rnsA = rna	ribonuclease I		1206	T	1	1206	1206	Gene	95	1	1990	ECRIBI34	M55687	ECORIBI34
14.40	lipBA,orf	in paper M82805		1420	T	4534	1	10490	JBCh	267	9512	1992	ECLIPAB	L07636	-
14.43	dacA	mut	H040.5	689	C	911	362	0	FEBS	165	185	1984	ECDACAG	X00273	ECODACA
14.45	rlpA	-		1408	C	1408	111	0	JBac	169	5692	1987	ECRLPA	M18276	ECORLPA
14.47	mrdB =rodA	-		1260	C	1260	89	0	JBac	171	558	1989	ECRODA	M22857	ECORODA
14.48	pbpA =mrdA	penicillin bind D00001		2936	C	2936	1	0	EJB	160	231	1986	ECPBPA	X04516	ECOPBPAA
14.60	holA	-		1261	T	1261	74	4806	Unpub.			1992	ECDELTA	L04576	ECODELTA
14.63	leuS	-	D100.0	3618	C	3618	1	0	NAR	15	10199	1987	ECLEUS	Y00869	ECOLEUS
14.70	cutE	-		2333	T	1	2333	2333	JBac	173	6742	1991	ECCUTE	X58070	ECOCUTE
15.00	potABCD	putrescine transport		4385	T	1	4385	4385	JBCh	266	20928	1991	ECPATABC	M64519	ECOPOTABCD
15.05	pgm,pmi	map position unsure		1945	T	1	1945	1945	Unpub.			1991	ECPGMPMI	M77127	ECOPGMPMI
15.10	metT	tRNA met leu gln1 gln2		1100	T	1100	1	12152	Cell	23	239	1981	ECTGOP	J01713	ECOTGOP
15.15	asnB	-		3080	C	2861	1	0	JBCh	265	12895	1990	ECASNB	J05554	ECOASNB
15.16	nagD	new BB		3619	C	2628	1	0	MoMB	3	505	1989	ECNAGACD	X14135	ECONAGACD
15.20	nagB	corr		3391	C	226	3391	0	Gene	62	197	1988	ECNAGBE	M19284	ECONAGBE
15.21	glnS	see 15.65 M10187 in Gb	G061.0	2306	C	190	2306	0	JBCh	257	11639	1982	ECGLNS	V01575	ECOGLNT
15.25	glnS	filling the gap BB		65	C	1	280	0	Unpub.			1984	--GLNS	0004MK	-
15.26	glnS	see 15.60 M10187 in Gb		215	C	0	0	0	JBCh	257	11639	1982	--GLNS	0004MK	-
15.40	fur (iron)	loc BB	G015.8	868	T	868	1	1799	MGG	200	110	1985	ECFUR	X02589	ECOFUR
15.41	fldA	flavodoxin		1164	C	931	1	0	JBac	173	1729	1991	ECFLDA	M59426	ECOFLDA
15.60	potE,speF	ornithine decarboxylase		4341	T	4341	1	24625	JBCh	266	20922	1991	ECPATESP	M64495	ECOPOTESPE
15.61	kdpED	-		3600	C	3435	621	0	JBac	174	2152	1992	ECKDPDE	M36066	ECOKDPDE
15.64	kdpCBA	-		4933	C	4933	1	0	PNAS	81	4746	1984	ECKDPABC	K02670	ECOKDPABC
15.66	rhsC	orf		10484	C	7	10484	0	Unpub.			1992	ECRHSCA	L02373	ECORHSCA
15.68	rhsC	3'-end		535	C	0	0	0	JBac	172	446	1990	ECRHSC	M29718	ECORHSC
15.70	phr	-		2039	C	383	2039	0	JBCh	259	6033	1984	ECPHRORF	K01299	ECOPHRORF
16.30	gltA	& cybB,sucCADB,sdhAB	H047.4	3264	T	1	13063	13881	BiCh	22	5243	1983	ECGLTA01	J01619	ECOGLTA
16.45	sucD	new BB		1285	C	818	1	0	BJ	260	737	1989	ECG30SUC	X15790	ECOG30SUC
16.50	lysT tRNA	& valT mut		730	T	1	730	730	JMB	177	609	1984	ECTRNKV	X04171	ECOTRNKV
16.60	cydA	map unclear corr BB		2901	T	1	3845	3845	JBCh	263	13138	1988	ECCYD	J03939	ECOCYD
16.70	tolQRA	& tolAB		1855	T	1	1855	5016	JBac	169	2667	1987	ECTOLQRA	M16489	ECOTOLQRA
16.71	tolAB	-		2900	C	200	2668	0	JBac	171	6600	1989	ECTOLAB	M28232	ECOTOLAB
16.72	pal	lipoprotein map acc KR		713	C	1	713	0	EJB	163	73	1987	ECPAL	X05123	ECOPAL
16.73	excC = pal	-		1531	C	652	1531	0	MoMB	6	735	1992	ECEXCCG	X65796	ECOEXCCG
16.80	nadA	new BB		1470	T	1	1470	1470	EJB	175	221	1988	ECNADA	X12713	ECONADA
16.85	aroG	-		2107	T	1	2107	2107	NAR	10	4045	1982	ECAROG	J01591	ECOAROG
17.01	galETK	- summ HD,BB		139	T	0	0	3646	Cell	12	847	1977	ECGALE	J01612	ECOGALE
17.05	galETK	mut J01612 in Gb		148	C	1	122	0	Gene	21	121	1983	ECGALEP	J01613	ECOGALE
17.08	galTE	-		2070	C	1	2070	0	NAR	14	7705	1986	ECGALET	X06226	ECOGALET
17.10	galK	length BB		1634	C	169	1622	0	NAR	13	1841	1985	ECGALK	X02306	ECOGALK
17.20	phrA	not identical to phr		1188	T	1	1188	1188	Unpub.			1993	ECPHRA	X69182	-
17.30	chlD	new BB		1608	T	1	1608	3508	JBac	169	1911	1987	ECCHLJD	M16182	ECOCHLJD
17.32	modABCD	molybdenum uptake, chlD		1900	C	1	1900	0	BioE	9	S66	1993	-	-	-
17.44	attb lam	& bioABFCD,uvrB summ BB		260	T	1	260	8634	Scie	197	1147	1977	ECLAMATT	J01638	ECOLAMATT
17.45	bioABFCD	-		5793	C	89	5786	0	JBCh	263	19577	1988	ECBIO	J04423	ECOBIO
17.48	uvrB	J01722 in Gb	C080.0	2605	C	40	2605	0	NAR	14	2637	1986	ECUVRB1	X03678	ECOUVRB1
17.49	uvrB	-	C080.0	2400	C	2291	2400	0	NAR	14	2877	1986	ECUVRB2	X03722	ECOUVRB2
17.70	moaABCDE	molybdopterin operon		3200	T	1	3200	3200	Unpub.			1993	ECMOAACD	X70420	-
17.80	dinG	lexA repressor binding		2417	T	1	2417	2417	JBac	174	5110	1992	ECDING	M81935	ECODING
18.00	dps	-		830	T	1	530	3966	GeDv	6	2646	1992	ECDPS	X69337	-
18.01	glnHPQ	(mut?) X01583 in Gb ?		3120	C	1	3436	0	MGG	205	260	1986	ECGLNHPQ	X14180	ECOGLNHPQ
18.20	chlEN	-		2492	T	1	2492	2492	JBac	170	4097	1988	ECCHLEN	M21151	ECOCHLEN
18.50	grx	-		1147	T	1	1147	1147	Gene	43	13	1986	ECGRX	M13449	ECOGRX
18.60	dacC	new BB		1505	T	1	1505	2303	NAR	16	1617	1988	ECDACC	X06480	ECODACC
18.61	deoR	-		986	C	798	1	0	NAR	13	5927	1985	ECDEOR	X02837	ECODEOR
18.80	poxB	M13947 in Gb	G058.0	1974	T	1	1974	1974	NAR	14	5449	1986	ECPOXB	X04105	ECOPOXC

Listing 1: (*continued*)

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18.95 artP       periplasmatic transport              1 T      1    909    909 Unpub.          1993 ECARTP   X69108 -
19.00 potFHGI    putrescine transport              5877 T      1   5877   5877 JBCh 268    146 1993 ECPOTFGHIM93239 ECOPOTFGHI
19.05 rimK       -                                 1559 T      1   1559   1559 MGG  217    281 1989 ECRIMK   X15859 ECORIMK
19.10 clpA       -                                 3380 T      1   3380   6952 JBCh 265   7886 1990 ECCLPAA  M31045 ECOCLPAA
19.15 aat,mdrA   & infA,serW                       3882 C   3572      1      0 Unpub.          1993 ECAAT    L10383 -
19.20 htrD,trxB  -                                 1288 T   1288    350   2141 JBac 175    166 1993 ECHTRD   M95935 ECOHTRD
19.22 trxB       -                        D031.5   1202 C   1202      1      0 JBCh 263   9015 1988 ECTRXB   J03762 ECOTRXB
19.30 artIQMJ    arg periplasm.transport           3708 T      1   3708   3708 Unpub.          1993 ECAPTS   X67753 -
19.40 alsB (lrp) leucine response         I015.1   1174 T      1   1174   1174 PNAS  70    302 1993 ECLRP    D11105 ECOLRP
19.50 cmlA ?     chloramphenicol transf.            930 T      1    930    930 BJ   272    505 1990 ECIICAT  X53796 ECOIICAT
19.90 livR       -                                  729 T      1    729    729 Prot   1    125 1986 ECLIVRA  M36020 ECOLIVRA
20.00 serS       -                        E048.8   1854 T      1   1854   7577 NAR   15   1005 1987 ECSERS   X05017 ECOSERS
20.01 dmsABC        map approx. 20 HD,Gb           6492 C    770   6492      0 MoMB   2    785 1988 ECDMS    J03412 ECODMS
20.10 orf,pfl    -                                 1392 T      1   1431   4884 JBac 171   2485 1989 ECPFLZ   M26413 ECOPFLZ
20.11 pfl        -                        G070.0   3592 C    140   3592      0 EJB  177    153 1988 ECPFL    X08035 ECOPFL
20.24 serC,aroA  1.part of divided seq.            1517 T      1   1490   2983 BJ   234     49 1986 M25608   M25608 ECOAROA
20.25 aroA       -                                 1284 C      1   1284      0 FEBS 170     59 1984 ECAROA   X00557 ECOAROA
20.26 aroA       2.part of divided seq.            1760 C   1552   1760      0 BJ   234     49 1986 M25608   M25608 ECOAROA
20.40 rpsA   S1  28 bp difference     MK            977 T      1    977   3032 MGG  196    135 1984 ECRPSA01 X00785 ECORPSAL
20.42 rpsA   S1  J01682 in Gb                      2412 C    708   2287      0 NAR   10   1857 1982 ECRSPA   V00352 ECORSPA
20.43 hip (himD) 122 bp lambda                      597 C      1    475      0 JMB  183    117 1985 ECHIP    X04864 ECOHIP
20.50 msbA       -                                 3468 T      1   3468   3468 MoMB   7     69 1993 ECMSBAG  Z11796 ECOMSBAG
20.60 mukB       M38402                            5353 T      1   5353   5353 EMBO  10    183 1991 ECMUKB   X57550 ECOMUKC
20.65 aspC,ompF  & asnS,pcnB,pepB     BB           1415 T   1415      1   9133 BJ   234    593 1986 ECASPC   X03629 ECOASPC
20.69 ompF       -                        B036.0   1807 C   1592      1      0 NAR   10   6957 1982 ECOMPF   J01655 ECOOMPF
20.74 asnS       -                        G099.0   2040 C   1928      1      0 Gene  84    481 1989 ECTGASNS M33145 ECOTGASNS
20.76 pncB                        new TP           1490 C   1205    417      0 JBCh 265  17665 1990 ECPNCB   J05568 ECOPNCB
20.77 pepN       -                                  870 C      0      0      0 EJB  155    565 1986 ECPEPN5  X03709 ECOPEPN5
20.78 pepN                          corr           2945 C      1   3409      0 Gene  48    145 1986 ECPEPN   M15273 ECOPEPN
20.90 bent 103   no neighboring gene                238 T      1    238    238 MGG  226    367 1991 ECBENT103X63980 ECOBENT103
21.20 pyrD       -                                 1357 T      1   1357   1357 EJB  151     59 1985 ECPYRD   X02826 ECOPYRD
21.65 rmf        ribosome modulation fac            600 T      1    600   1209 EMBO  12    625 1993 -        -      -
21.67 fabA       only 726 bp      acc.BB  H017.2    979 C    609      1      0 JBCh 263   4641 1988 ECFABAA  J03186 ECOFABAA
21.71 ompA,sulA  mut        J01654 in Gb           2271 T      1   2271   2271 NAR    8   3011 1980 ECOMPA   V00307 ECOOMPA
22.00 helD       helicase V                        2821 T      1   2821   2821 JBCh 264   8297 1989 ECHELIV  J04726 ECOHELIV
22.10 hyaABCDEF              loc acc KR            6023 T      1   6023   6023 JBac 172   1969 1990 ECHYA    M34825 ECOHYA
22.30 serT       = divE  ser tRNA                  1336 T      1   1336   1336 EMBO   3   1103 1984 ECDIVE   X00547 ECOTGS
22.50 appCB      -                                 2928 T      1   2690   4591 MGG  229    341 1992 -        -      -
22.52 appA       correction of 22.60               1901 C      1   1901      0 JBac 172   5497 1990 ECAPPAA  M58708 ECOAPPAA
22.60 agp        glucose-1-phosphatase             1675 T      1   1674   1674 JBac 172    802 1990 ECAGPA   M33807 ECOAGPA
22.80 putACP     also ECPUTC M35174                 730 T      1   2212   2212 MGG  210    364 1987 ECPUTP   X05653 ECOPUTC
23.00 terE       near pyrC                           22 T      1     22     22 JBac 173    391 1991 ECTERE   X64000 ECOTERE
23.10 msyB,orf   multicopy suppression             2676 T      1   2676   2676 JBac 174   1454 1992 ECMSYB   X59939 ECOMSYB
23.15 csgA       curlin subunit gene                649 T      1    649    649 MoMB   7    523 1993 -        L04979 -
23.20 serX       2. tRNA Ser5 locus                1000 T      1   1000   1000 JMB  212    579 1990 ECTRNS5  X52787 ECOTRNS5
23.30 IS3D       flanking sequences                 563 T      1    563    563 Unpubl.         1993 ECIS3D   D12597 -
23.40 htrB       -                                 3129 T      1   3129   3129 Unpub.          1991 ECHTRB   X61000 ECOHTRB
23.50 pyrC       D00002 in Gb                      2046 T      1   2046   2046 EJB  160     77 1986 ECPYRC   X04469 ECOPYRH
23.60 g20.3, tcp tcp = rimJ                        1609 T      1   1609   1609 JBac 174   7003 1992 ECRIMJA  M99278 -
23.61 rimJ                        new BB           1220 C      0      0      0 MGG  209    481 1987 ECRIMJ   X06118 ECORIMJ
23.70 phoH,orf1  = psiH                            2250 T      1   2250   2250 JBac 175   1316 1993 -        D90448 -
24.00 mopA*    = groE = ams ?   loc ? BB  B056.5    595 T      1    595    595 JBac 161    446 1985 ECAMS    M11294 ECOGROELA
24.10 ams        correction                        4000 T   4000    541   8929 JMB  228     30 1992 ECGAMS   X67470 ECOGAMS
24.11 ams = rne  & orf                             3959 C   1428      1      0 JBCh 266   2843 1991 ECAMSG   M62747 ECOAMSG
24.15 g30k,orfYX -                                 1294 C     81    784      0 Unpub.          1992 ECG30K   M96791 ECOG30K
24.16 rpmF   L32 -                                 1191 C      1   1059      0 JBac 171   5707 1989 ECRPMFA  M29698 ECORPMFA
24.17 plsX,fabH  -                                 1428 C      1   1428      0 JBCh 267   6807 1992 ECPLSFABAM96793 ECOPLSFABA
24.18 fabH       ketoacylcarrier KAS III           1273 T    424   1273      0 JBCh 267   6807 1992 ECFABH   M77744 ECOFABH
24.40 fabD       -                                 1608 T      1   1395   2773 JBac 174   2851 1992 ECFABD   M87040 ECOFABD
24.41 fabDG,acpP bad name fabG (71.13)             1378 C      1   1378      0 JBCh 267   5751 1992 ECFABACP M84991 ECOFABACP
24.70 ptsG       -                        H042.6   1523 T      1   1523   4124 JBCh 261  16398 1986 ECPTSG   J02618 ECOPTSG
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24.71	fhuE	Fe recep M16186 Gb KR		2899	C	2601	1	0	MoMB	4	427	1990	ECFHUE1	X17615	ECOFHUE1
24.80	ndh	J01653 in Gb;loc acc KR		2057	T	1	2057	2057	EJB	116	165	1981	ECNDHX	V00306	ECONDHX
25.00	pabC	aminodeoxychorismate ly		1667	T	1	1667	1667	JBac	174	5317	1992	ECPABC	M93135	ECOPABC
25.20	att e14R	- M19689 in Gb?		439	T	1	439	439	JBac	170	2040	1988	ECATTE	M19683	ECOATTE
25.30	mfd	mutation frequ. decline		3447	F	0	0	3447	Scie	260	53	1993	-	-	-
25.40	icd	-	C043.8	1248	T	1	1568	1568	JBCh	262	10422	1987	ECICD	J02799	ECOICD
25.50	lit	-		1772	T	1	1772	1772	JBac	170	2056	1988	ECLIT	M19634	ECOLIT
25.60	phoQ,phoP	-		4097	T	4097	1	5961	JBac	174	492	1992	ECPHOPQ	D90393	ECOPHOPQ
25.63	purB,phoP	-		2986	C	1864	1	0	Unpub.			1992	ECPURB	X59307	ECOPURB
25.70	pin1 =	att e14 K03521 in Gb		2614	T	1	2613	2613	EMBO	4	237	1985	ECPIN1	X01805	ECOPIN1
25.80	mcrA			1040	T	1	1040	1054	JBSc	17	217	1992	ECMCRAGNA	Z19104	-
25.81	mcrA	bad coding sequence		853	C	840	853	0	JBac	173	7368	1991	ECMCRA	M76667	ECOMCRA
25.90	fadR	224 bp lambda in Em BB		1070	T	1070	74	5524	NAR	16	7995	1988	ECFADR	X08087	ECOFADR
25.92	nhaB	-		2321	C	1	2072	0	JBCh	267	11064	1992	ECNHAB	M83655	ECONHAB
25.93	umuCD	-		2454	C	2454	1	0	PNAS	82	4336	1985	ECUMUCD	M10107	ECOUMUCD
26.00	dadAX, orf	-		4386	T	1	4386	4386	Unpub.			1992	ECDADAX	L02948	ECODADAX
26.10	minBCDE	(minCDE) loc ?		2400	T	1	2400	2400	Cell	56	641	1989	ECMINB	J03153	ECOMINB
26.30	treA	= osmA		2538	T	1	2538	2538	MGG	217	347	1989	ECTREA	X15868	ECOTREA
26.40	rap,pth	-		1620	T	1	1620	1620	EMBO	10	3549	1991	ECPTHG	X61941	ECOPTHG
26.60	prs	next to hemA acc KR		1785	T	1785	1	5495	JBCh	261	6765	1986	ECPRS	M13174	ECOPRS
26.62	orf1,2,prs	sequencing across BamHI		1848	C	1331	1	0	Unpub.			1991	ECPRSA	M77237	ECOPRSA
26.64	hemA,pfrA	last 83 bp from lambda		2925	C	1333	2271	0	Gene	82	209	1989	ECHEMA	M30785	ECOHEMA
26.67	prfA (RF1)	-	H021.6	1440	C	1	1440	0	PNAS	82	3616	1985	ECRF1X	M11519	ECORF1X
26.70	kdsA	-		1504	T	1	1504	1504	MGG	207	369	1987	ECKDSA	X05552	ECOKDSA
26.93	narLXK	compilation of nar data		0	T	4160	950	13023	Unpub.			1992	ECNARXLO	X69189	-
26.99	narX	new BB		3211	C	0	0	0	NAR	17	2947	1989	ECNARXL	X13360	ECONARXL
27.00	narX(R)KG	-		2482	C	599	2482	0	FEBS	252	139	1989	ECNARK	X15996	ECONARK
27.01	narX(narQ)	correction; narQ ??		179	C	0	0	0	Unpubl.			1992	ECNARX	X65715	ECONARX
27.02	narG	-		509	C	135	509	0	FEBS	177	260	1984	ECNARG1	X01164	ECONARG
27.05	narH	-		5400	C	447	5400	0	MGG	218	249	1989	ECNARGHJ	X16181	ECONARGHJ
27.07	narJI	-		1890	C	595	1890	0	JBac	170	1721	1988	ECNARI	M20147	ECONARI
27.16	tyrTV,tpr	K01197 in Gb		1545	C	1	1303	0	JMB	155	83	1982	ECTRNYSU	X04168	ECOTGY1
27.26	hnr	1305 kb		1	T	1	1161	1161	Unpub.			1992	ECHNRG	X66003	-
27.30	galU	orf1 of X59940 is galU		1288	T	1	1288	14663	Unpub.			1992	ECGALU	M98830	ECOGALU
27.31	msyA =H-NS	multicopy suppression		1993	C	1289	1987	0	JBac	174	1454	1992	ECMSYA	X59940	ECOMSYA
27.38	tdk	thymidine kinase		1095	C	1	1095	0	MoMB	5	373	1991	ECTDKG	X53733	ECOTDKG
27.40	orf	A.Danchin		3060	C	1790	2928	0	Unpub.			1992	ECTKAD	X67326	ECOTKAD
27.42	adhE	alcohol DH		2759	C	2759	1	0	Gene	85	209	1989	ECADHEX	M33504	ECOADHEX
27.43	adhE	-		2023	C	2023	1	0	FEBS	281	59	1991	ECADHEG	X59263	ECOADHEG
27.44	oppA	S.Short		7005	C	1	3739	0	Unpub.		K.Rudd	1991	-	ES3072	oppAeco
27.45	oppA	oligopeptide binding		1920	C	1	1920	0	JBCh	265	8387	1990	ECOPPA	J05433	ECOOPPA
27.55	lpd,kch	att phi80, tonB		3951	T	3951	239	17253	Unpub.			1993	ECKCH	L12044	-
27.57	tonB	summ KR		1291	C	1	1697	0	PNAS	80	5235	1983	ECTONB	K00431	ECOTONB
27.59	tonA, P14	-		653	C	0	0	0	Cell	41	577	1985	ECTONB	K00431	ECOTONB
27.60	trp - tonB	intergenic region		3779	C	3641	1	0	G	120	345	1988	ECTRTOI	X13583	ECOTRTOI
27.61	trpE	-		140	C	7134	1	0	JMB	121	113	1978	ECTGP	J01714	ECOTGP
27.79	trpABCDE	-		7017	C	0	0	0	NAR	9	6647	1981	ECTGP	J01714	ECOTGP
27.87	trp 5'end	-		1202	C	1068	1	0	Bioo	10	415	1984	ECTRPZ	M38366	ECOTRPZ
28.20	btuR	gap of 300 bp to sohB		952	T	952	1	952	JBac	171	154	1989	ECBTUR	M21528	ECOBTUR
28.30	sohB,topA	suppressor of htrA		1588	T	1	1588	10963	JBac	173	5763	1991	ECSOHB	M73320	ECOSOHB
28.31	topA	-	I115.0	4071	C	784	4071	0	JMB	191	321	1986	ECTOPA	X04475	ECOTOPA
28.32	cysB	-		1840	C	668	1691	0	JBCh	262	5999	1987	ECCYSB	M15041	ECOCYSB
28.34	acn, ribA	-		4245	C	232	3972	0	EJB	204	599	1992	ECACN	X60293	ECOACN
28.35	ribA	GTP cyclohydrolase II		1500	C	1323	1	0	Unpub.			1992	ECRIBA	X67876	-
28.50	pgpB	-		1113	T	1	1113	1113	JBac	170	5117	1988	M23628	M23628	M23628
28.75	rnb	bad name EMBL		2181	T	1	2181	2181	MoMB	8	43	1993	ECRMBG	X67913	-
28.80	terC1	within pyrF		487	T	1	488	2155	Cell	55	467	1988	ECTERC1A	M23250	ECOTERC1A
28.81	pyrF	-		1549	C	364	1549	0	JBCh	262	10239	1987	ECPYRF	J02768	ECOPYRF
28.83	osmB	osmotic. ind. lipoprot.		652	C	481	1	0	JBac	171	511	1989	ECOSMB	M22859	ECOOSMB
28.91	envM	-		1366	T	1	1366	0	JGMi	138	209	1992	ECENVM	M97219	-
29.10	pspABCDE	stress induced operon		2424	T	1	2424	2424	JMB	220	35	1991	ECPSP	X57560	ECOPSP

Listing 1: (*continued*)

29.20	tyrR	-		1964	T	1	1964	1964	JBCh	261	403	1986	ECTYRR	M12114	ECOTYRR
29.22	tyrR	correction		0	C	0	0	0	JBac	175	1767	1993	-	M12114	-
29.30	prrBCD			3853	T	1	3853	3853	EMBO	9	1383	1990	ECPRRBCD	X52284	ECOPRRBCD
29.50	ALDH	similar to mamm. aldh		2883	T	1	2883	2883	Gene	99	15	1991	ECALDHQ3	M38433	ECOALDHQ3
29.80	fnr (nirR)	-		1641	T	1641	341	2019	NAR	10	6119	1982	ECFNR	J01608	ECONIRR
29.81	ogt,fnr	summ BB		719	C	718	1	0	NAR	15	9177	1987	ECOGT	Y00495	ECOOGT
29.90	dbpA	-		1668	T	1	1668	1668	NAR	18	5413	1990	ECDEADA	X52647	ECODEADA
30.00	bent 108	no neighboring gene		315	T	1	315	315	MGG	226	367	1991	ECBENT108	X63985	ECOBENT108
30.20	racC,recE	-		2475	T	1	2475	2475	JBac	171	2101	1989	ECRECEA	M24905	ECORECEA
30.50	trkG	within rac prophage		1817	T	1	1817	1817	JBac	173	3170	1991	ECTRKG	X56783	-
30.95	dcp	-		2906	T	1	2906	2906	JBac	174	1698	1992	ECDCPG	X57947	ECODCPG
31.00	cybB	-		1439	T	1	1439	1439	MGG	212	1	1988	ECCYBB	X07569	ECOCYBB
31.10	trg	-		1722	T	1	1722	1722	PNAS	81	3287	1984	ECG	K02073	ECOTRG
31.85	orf-H	flanking seq. of rhsE		1331	T	1	1331	1331	Unpub.			1992	ECRHSEA	L02372	ECORHSEA
31.90	rhsE	-		2440	T	1	2440	2440	NAR	19	7177	1991	ECRHSEG	X60998	ECORHSEG
32.00	orf,IS2,30	near repl. terminus		9415	T	1	9415	9415	BchF	0	0	1991	ECIS2IS30	X62680	ECOIS2IS30
32.10	ald	-		1764	T	1	1764	1764	JBac	173	6118	1991	ECALD	M64541	ECOALD
32.20	attP2 III	-		497	T	1	493	497	JBac	174	4086	1992	ECBP2ASC	Z11493	ECOBP2ASC
32.40	osmC	-		998	T	1	998	998	JMB	220	959	1991	ECOSMC	X57433	ECOOSMC
32.60	rimL	map acc. KR		1248	T	1	1248	1248	MGG	217	289	1989	ECRIML	X15860	ECORIML
33.10	narZYWV	second nar operon		7080	T	1	7080	7080	MGG	222	104	1990	ECNARZYW	X17110	ECONARZYW
33.40	fdnGHI	fdhGHI ?		4981	T	1	4981	4981	JBCh	266	22380	1991	ECFDNGHI	M75029	ECOFDNGHI
33.50	sfcA	new KR, fusion with rec		1765	C	1	1765	1765	G	125	261	1990	ECSBCA8	X55956	ECOSBCA8
33.60	marAR	-		7876	T	1	7876	7876	JBac	175	1484	1993	ECMARAR	M96235	ECOMARAR
33.70	gadB	map (1589) and sequence		1421	T	1	1421	1421	JBac	174	5820	1992	ECGADB	M84025	ECOGADB
33.90	hip	hip operon orf1 & orf2		2235	T	1	2235	2235	JBac	173	5732	1991	ECHIPO	M61242	ECOHIPO
34.40	terC3	-		454	T	1	454	454	Cell	55	467	1988	ECTERC3A	M23252	ECOTERC3A
34.50	uxaB	new BB		286	T	1	286	286	JGMi	132	697	1986	ECUXAB	M15737	ECOUXAB
34.60	ecos1	within qin at ca. 35.1		2078	T	1	2078	2078	NAR	20	3357	1992	ECS1G	D00927	ECOS1G
34.70	relB	-		2142	T	1	2141	2141	EMBO	4	1059	1985	ECRELB	X02405	ECORELB
34.90	dicBAC	-		968	T	1	4440	4440	NAR	14	6821	1986	ECDICABC	X04395	ECOICABC
35.40	pntAB	-		3524	T	1	3524	3524	Unpub.			1992	ECPNT	X66086	ECOPNT
35.60	tus terC2	& fumCA,manA J04507 ?		2416	T	1	520	6149	PNAS	86	1593	1989	--TAU	0016MK	-
35.61	tau	= tus term.pr.		2079	C	1	2079	0	JBCh	264	21031	1989	ECTAU	D90037	ECOTAU
35.65	fumCA	-		2250	C	516	430	0	BJ	237	547	1986	ECFUMC	X04065	ECOFUMC
35.66	fumA	-		2408	C	2408	550	0	NAR	12	3631	1984	ECFUMA	X00522	ECOFUMA
35.67	manA	-		1604	C	1	1604	0	Gene	32	41	1984	ECMANAA	M15380	ECOMANAA
35.70	uidA	-		460	T	0	0	2439	MGG	199	101	1985	ECUIDA1	X02395	ECOUIDA1
35.71	uidA	-		2439	C	1	2439	0	PNAS	83	8447	1986	ECUIDAA	M14641	ECOUIDAA
35.80	hdhA	-		1785	T	1785	845	6319	JBac	173	2173	1991	ECHSDH	D10497	ECOHSDH
35.82	malIXY	correction within malX		3119	C	2	4197	0	JBac	173	4862	1991	ECMALAA	M60722	ECOMALAA
35.83	add	-		1200	C	19	1200	0	BiCh	30	2273	1991	ECADD	M59033	ECOADD
36.00	tyrS	-	G044.0	1275	T	1275	1	2369	FEBS	150	419	1982	ECTYRS	J01719	ECOTYRS
36.01	pdxH	-		1142	C	1094	1	0	JBac	174	6033	1992	ECTYSPDH	M92351	ECOTYSPDH
36.10	rnt	& RNA helicase like pr.		1323	T	1	1323	1323	JBCh	267	25609	1992	ECRNTASET	L01622	ECORNTASET
36.20	valV, valW	new tRNA Val2A,B locus		300	T	1	300	300	JMB	212	579	1990	ECTRNAV2	X52788	ECOTRNAV2
36.40	nth	map		780	T	1	780	780	BiCh	28	4444	1989	ECNTH	J02857	ECONTH
36.50	sodB	loc BB	F021.3	970	T	1	970	970	JBCh	263	1555	1988	ECSODB	J03511	ECOSODB
36.60	purR	correction for J04212		513	T	1	2041	2041	EJB	187	373	1990	ECPURRRP	X51368	ECOPURRRP
36.65	cfa	-		1575	T	1	1575	1575	BiCh	31	11020	1992	ECCFAX	M98330	-
36.80	lpp	-	G011.4	814	T	1	814	814	Cell	18	1109	1979	ECLPP	J01645	ECOLPP
37.00	aroD	loc BB		1798	T	1	1798	1798	BJ	238	475	1986	ECAROD	X04306	ECOAROD
37.10	ppsA	near aroH strain DH1	B083.0	3312	T	1	3312	3668	MGG	231	332	1992	ECPPSGENE	X59381	ECOPPSGENE
37.11	ppsA	strain W3110	B083.0	3662	C	3307	3662	0	Unpub.			1991	ECPEPSYN	M69116	ECOPEPSYN
37.20	aroH, urfA	-		2054	T	1	2054	2054	Gene	102	87	1991	ECAROHA	M38266	ECOAROHA
37.43	btuD	-		2600	T	3169	378	10765	JBac	167	928	1986	ECBTUCED	M14031	ECOBTUCED
37.47	himA	-		5972	C	5972	5784	0	Unpub.			1985	ECHIMA	K02844	ECOHIMA
37.50	pheST,infC	also M10430		3060	C	7784	1	0	JBac	163	787	1985	ECTHRINF	V00291	ECOTHRINF
37.70	pfkB	-	E036.6	409	T	1	423	1263	JMB	168	285	1983	ECPFKB	K00128	ECOPFKB
37.71	pfkB	-	E036.6	1249	C	410	1249	0	Gene	28	337	1984	ECPFKBK	K02500	ECOPFKBK
37.90	katE	catalase HPII		3466	T	1	3466	10563	JBac	173	514	1991	ECKATE	M55161	ECOKATE

37.91	katE,celE	-		588	C	488	101	0	Unpub.			1992	ECCELKATE	X66725	ECOCELKATE
37.92	celABCDF	cryptic cel operon		4989	C	4989	1	0	G	124	455	1990	ECCELOPE	X52890	ECOCELOPE
37.94	anr	activator of ntr-like p		520	C	436	1	0	Unpub.			1991	ECANRG	X60186	ECOANRG
37.95	ntr-like	109 bp IS21 new BB		1493	C	102	1384	0	JBac	169	260	1987	ECNTRLA	M15328	ECONTRLA
38.00	bent 106	no neighboring gene		302	T	1	302	302	MGG	226	367	1991	ECBENT106	X63983	ECOBENT106
38.30	xthA	-		1246	T	1	1246	1246	Unpub.			1988	ECXTHA	X13002	ECOXTHA
38.40	gdhA map	-	G043.6	1937	T	1	1937	1937	Gene	27	193	1984	ECGDHAK	K02499	ECOGDHAK
38.55	topB,selD	& orf183,sppA		2540	T	2540	1	5982	JBCh	264	17924	1989	ECTOPB	J05076	ECOTOPB
38.56	selD	-		1202	C	741	1	0	PNAS	87	543	1990	ECSELD	M30184	ECOSELD
38.57	orf183	between sppA and selD		780	C	736	288	0	JBac	173	4983	1991	ECORF183	M68961	ECOORF183
38.58	sppA	-		2252	C	1	2252	0	JBCh	261	9405	1986	ECSPPA	M13359	ECOSPPA
38.80	ansA &	orf1,2		2156	T	1	2156	2156	Gene	78	37	1989	ECANSORA	M26934	ECOANSORA
39.35	gapDH	-	H034.3	1523	T	1	1523	1523	EJB	150	61	1985	ECGAP	X02662	ECOGAP
39.60	rnd	E.coli D		1354	C	0	0	0	NAR	16	6265	1988	ECRND	X07055	ECORND
39.80	pabB	-		1623	T	1	1623	1623	JBac	159	57	1984	ECPABB	K02673	ECOPABB
39.90	fadD	-		2230	T	1	2230	2230	JBCh	267	25513	1992	ECFADD	L02649	-
40.10	ptsMPL	-		3179	T	1	3188	3188	JBCh	262	5238	1987	ECPTSLPM	J02699	ECOPTSLPM
40.40	htpX	new heat shock protein		1224	T	1224	954	3449	JBac	173	2944	1991	ECHTPX	M58470	ECOHTPX
40.41	prc	-		3178	C	3178	1	0	JBac	173	4799	1991	ECPRC	D00674	ECOPRC
40.80	eda,edd	eda = hga 2D: eda	F022.5	2937	T	2937	73	5195	JBac	174	4638	1992	ECEDDEDA	M87458	ECOEDDEDA
40.82	zwf	glucose-6-phosph.dehydr	F048.8	2330	C	2330	1	0	JBac	173	968	1991	ECZWF	M55005	ECOZWF
40.85	pykA	pyruvate kinase II		1640	T	1	1105	3694	Unpub.			1991	ECPYKAA	M63703	ECOPYKAA
40.96	msbB	multicopy supp. of htrB		2589	C	2589	1	0	JBac	174	702	1992	ECMSBBA	M77039	ECOMSBBA
41.10	ruvBA	new BB		2685	T	2685	1	8286	JBac	170	4322	1988	ECRUVA01	M21298	ECORUVABA
41.13	ruvC,orf23	-		3255	C	2850	1	0	JBac	173	5747	1991	ECRUVC	D10165	ECORUVC
41.14	aspS	aspartyl-tRNA synthetas		3866	C	2751	1	0	NAR	18	7109	1990	ECASPS	X53863	ECOASPS
41.30	argS	length BB	E058.0	2372	T	1	2372	2372	NAR	17	5725	1989	ECARGS	X15320	ECOARGS
41.45	cheZYBR	-		3063	T	3063	17	12141	JBac	165	161	1986	ECCHE3	M13463	ECOCHE3
41.49	tap	-	D058.1	3465	C	3465	1	0	Cell	33	615	1983	ECTARX	V01504	ECOCHE2
41.51	cheA	-		1360	C	1198	1	0	JBac	165	161	1986	ECCHE1	M13462	ECOCHE1
41.53	cheW	-		2190	C	1393	1	0	Unpub.			1990	ECCHEA	M34669	ECOCHEA
41.54	motB	-		974	C	0	0	0	JBac	166	244	1986	ECMOTB	M12914	ECOMOTAB
41.55	motA	2005 bp EMBL ?		1076	C	1883	1	0	JBac	159	991	1984	ECMOTAB	J01652	ECOMOTAB
41.57	flbB,flhD	-		0	C	1155	1	0	JBac	170	1575	1988	ECFLBA	M19439	ECOFLBA
41.80	araFGH	Corr map BB		4200	T	4200	5	4211	JMB	197	37	1987	ECARAFGH	X06091	ECOARAFGH
41.82	araFGH	see als ECARAAA M65192		530	C	15	1	0	JMB	215	497	1990	ECARAFGHJ	X58969	ECOARAAA
42.00	gen-165	-		823	T	1	823	823	MGG	225	510	1991	ECRSGA	X53513	ECORSGA
42.20	tyrP	length BB		1935	T	1	1947	1947	JBac	170	4946	1988	M23240	M23240	ECOTYRPA
42.30	leuZ, glyW	insertion M14391 in Gb		890	T	890	285	5954	BChF	67	1053	1985	ECGLYWG	X03239	ECOGLYWG
42.33	pgsA	-		955	C	955	157	0	JBCh	261	1329	1986	ECGLYWA	M12299	ECOPGSA
42.35	uvrC,orf &	psgA X03691 in Gb		120	C	4549	1	0	EMBO	2	2313	1983	ECUVRC	X00189	ECOUVRC
42.60	flbC,hag48	hag48 = wt		2526	T	2526	561	11438	MGG	216	44	1989	ECHAG48	X17440	ECOHAG48
42.63	fliDST	-		2400	C	1	2384	0	JGMi	138	105	1992	ECFLGPRO	M85240	ECOFLGPRO
42.64	fliT,amyA	-		1700	C	101	1588	0	JBac	174	6644	1992	ECFTAA	L01642	ECOFTAA
42.65	amyA,fliE	2.7 kb non coding !!!		5160	C	69	5123	0	Unpubl.			1993	ECAMYAP	L13279	-
42.66	fliE,fliF	-		674	C	545	1	0	JBac	174	2298	1992	ECFLIE	M84992	ECOFLIE
42.70	fliG	Roman,Frantz,Matsumura		1086	T	1	1086	1086	Unpubl.			1993	ECFLIG	L13243	-
42.74	flaAI	-		1763	T	1	1763	2211	JBac	166	1007	1986	ECFLAA	M12784	ECOFLAA
42.76	motD,fliM	-		499	C	52	499	0	JBac	171	2728	1989	M26294	M26294	M26294
42.90	dcm,orf	-		3655	T	1	3655	3655	NAR	17	5844	1989	ECDCM	X13330	ECODCM
43.00	rcsA	polysaccharide regulato		934	T	1	934	934	Unpub.			1991	ECRCSA	M58003	ECORCSA
43.10	amn	AMP nucleosidase	G052.0	1803	T	1	1803	1803	BiCh	28	8726	1989	ECAMN	M30469	ECOAMN
43.20	asnT	tRNA Asn near tRNA Ser2		200	T	1	200	200	JMB	212	579	1990	ECTRNAN	X52790	ECOTRNAN
43.21	serU mut	tRNA ser2		150	T	0	0	287	JBac	161	207	1985	ECTGSSD	M10746	ECOTGSSD
43.22	supD	tRNA ser2		287	C	1	287	0	Unpub.			1985	ECTGSSD	M10746	ECOTGSSD
43.30	aspV	tRNA Asp(1)	C028.8	284	T	1	284	284	MGG	206	356	1987	ECASPV	X14007	ECOASPV
43.40	asnU	2. locus for tRNA Asn		200	T	1	200	200	JMB	212	579	1990	ECTRNAN2	X52791	ECOTRNAN2
43.45	asnV	3. locus for tRNA Asn		200	T	1	200	200	JMB	212	579	1990	ECTRNAN3	X52792	ECOTRNAN3
43.60	attP2H	-		302	T	1	302	302	JBac	174	4086	1992	ECBP2ASA	Z11491	ECOBP2ASA
43.70	sbcB	-		1927	T	1	1927	1927	JBCh	262	455	1987	ECSBCB	J02641	ECOSBCB
43.90	hisG	corr J01627 in Gb		708	T	1	714	7789	NAR	9	2075	1981	ECHIS1	V00284	ECOHIS1

Listing 1: (*continued*)

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43.91 hisGDCBHAF                 corr BB             7390 C    316   7390      0 JMB  203    585 1988 ECHISOP  X13462 ECOHISOPA
44.20 rod        regulator of O length               1330 T      1   1330   1330 JBac 174   5228 1992 ECREGPOL M89934 ECOREGPOL
44.40 rfbMK, orf -                                   4278 T      1   4278   5696 Unpub.          1992 ECGDPMPP L04596 -
44.41 gnd        -                        C042.6     1887 T    742   1887      0 Gene  27    253 1984 ECGND    K02072 ECOGND
44.43 gnd        is5 insertion            C042.6     1013 C      1    272      0 MBE    5    691 1988 ECGNDF   M23181 ECOGNDF
44.80 alkA                 loc 44.7 BB ?             1942 T      1   1942   1942 JBCh 259  13730 1984 ECALKA   K02498 ECOALKA
45.00 folE       = flrD ?                            1113 T      1   1113   1113 BCHS 372    991 1991 ECFOLE   X63910 ECOFOLE
45.60 dcd        -                                   1298 T      1   1298   1298 JBac 174   5647 1992 ECDCDA   M90069 ECODCDA
45.80 ptsF,orf3  ptsF = fruA                         2600 T      1   2600   2600 JGMi 134   2757 1988 M23196   M23196 M23196
45.90 mrp,metG   -                                   1506 T      1   1094   3712 MGG  223    121 1990 ECMRPMET X55791 ECOMRPMET
45.91 metG ST    45.6 Bachmann map                   1986 C      1   2346      0 EJB  127    449 1982 ECMETG   J01649 ECOMETG
45.93 metG 5'end -                        G072.0      347 C     76    347      0 MGG  223    121 1990 ECMRPMET X55791 ECOMRPMET
46.00 proL       new locus for tRNA Pro2              300 T      1    300    300 JMB  212    579 1990 ECTRNAP2 X52793 ECOTRNAP2
46.10 cdd        cAMP regul. promoter                 485 T      1    187   1327 MoMB   3   1385 1989 ECCCDP   X16419 ECOCCDP
46.12 cdd        -                                   1291 C     22   1291      0 BiCh  31   4168 1992 ECCDDA   M60916 ECOCDDA
46.20 dld        -                        H062.0     2340 T      1   2340   2340 EJB  144    367 1984 ECDLD    X01067 ECODLD
46.30 mglB       -                                   4509 T   4509      1   6243 MGG  229    453 1991 ECMGLABC M59444 ECOMGLABCO
46.33 galS,orf   -                                   1990 C      1   1734      0 JBac 173   7412 1991 ECGALS5  X62529 -
46.40 lysP,cir   -                                   2661 T      1   2661   4322 JBac 174   3242 1992 ECLYSPP  X65029 ECOLYSP
46.42 cir        -                                   2240 C    579   2239      0 JBac 171   1041 1989 ECCIR    J04229 ECOCIR
46.50 colicin A  map uncertain                        458 T      1    458    458 Unpub.          1991 ECCOLAA  M57686 ECOCOLAA
46.60 nfo                         loc BB             1020 T      1   1020   1020 JBac 170   5141 1988 ECNFO    M22591 ECONFO
46.65 IS3E       flanking sequences                   562 T      1    562    562 Unpub.          1993 ECIS3E   D12598 -
46.90 fruK       -                                   1491 T      1   1148   3748 PRSB 242     87 1990 ECFRUK   X53948 ECOFRUK
46.91 fruA                            KR             2600 C      1   2600      0 JGMi 134   2757 1988 M23196   M23196 M23196
47.60 ada        -                        I039.5      267 T      1    267   1997 Cell  45    315 1986 ECADAPA  M13155 ECOADAPA
47.61 ada        -                        I039.5     1324 C    189   1324      0 JBCh 260   7281 1985 ECADA    M10211 ECOADA
47.63 alkB       -                                    959 C    366    959      0 JBCh 261  15772 1986 ECADAB   J02607 ECOADAB
47.70 rplY   L25 -                                   1116 T      1   1116   1116 MGG  226    341 1991 ECD13326 D13326 ECORPLY
47.80 ompCR,micF -                                    240 T      1   1713   1713 FEBS 151    159 1983 ECOMPC   K00541 ECOOMPC
48.10 rcsCB      including unpubl.data               5246 T      1   5246   5246 JBac 172    659 1990 ECRCSBC  M28242 ECORCSBC
48.15 10K protei H-NS dependent expressi             1854 T   1854      1   3240 Unpub.          1992 EC10KLS  D11109 ECO10KLS
48.16 orfD       hns-dependent expressio             1766 C    381   1766      0 Unpub.          1992 ECHSND   D11389 ECOHSND
48.20 gyrA,pufXY -                                   4729 T   4729   1214   5631 MoMB   1    259 1987 ECGYRAAM Y00544 ECOGYRAAM
48.25 ubiG       -                                   2123 C      9   2123      0 JMG  138   2101 1992 ECUBIG   M87509 ECOUBIG
48.50 nrdAB      -                                   8554 T      1   8554   8554 PNAS  81   4294 1984 ECNRDA   K02672 ECONRDA
48.70 glpQ       & glpTABC                C039.0     1118 T   1118      1   7240 MGG  226    321 1991 ECGLPQ   X56907 ECOGLPQ
48.71 glpT                        new HD             1560 C   1502    120      0 MoMB   1    251 1987 ECGLPT   Y00536 ECOGLPT
48.72 glpABC     -                                   4739 C      1   4739      0 JBac 170   2448 1988 ECGLPA   M20938 ECOGLPA
48.95 menC       -                                    970 T    970    150   2190 Unpub.          1992 ECMENC   L07256 -
48.96 menB       -                                   1349 C   1349      1      0 JBac 174   5057 1992 ECDHNASYNM93421 ECODHNASYN
49.00 menD       -                                   2345 T      1   1560   2394 JBac 171   4349 1989 ECMEND   M21787 ECOMEND
49.01 menD       correction                           834 C      1    834      0 JBac 174   8111 1992 ECMENDA  L04464 ECOMENDA
49.20 nuo        14 genes, H.Weiss unpub             9000 T      1   9000   9000 BioE   9    S65 1993 -        X68301 -
49.40 eci        ecotin gene                          876 T      1    217    887 FEBS 287     53 1991 ECECOTIN X61951 ECOECOTIN
49.41 ecotin     -                                    672 C      1    672    672 JBCh 266   6620 1991 ECECOA   M60876 ECOECOA
49.50 ackA                 loc 49.8 BB ?             1758 T      1   1758   1758 JBac 171    577 1989 ECACKA   M22956 ECOACKA
49.60 IS1H       8. IS1 copy                          129 T      1    129    129 JBac 175   1552 1993 -        M99414 -
49.80 hisMP                      2D:hisP  I026.2     1332 T      1   1332   1332 NAR   15   8568 1987 ECHISMP  Y00455 ECOHISMP
49.90 argT,dedF  & purF,dedEDCBA,hisT                6172 T   6172   4733  10714 JBCh 262  12209 1987 ECHISPUR J02800 ECOHISPUR1
49.91 purF                  J01666 in Gb  E054.1     2478 C   1904      1      0 JBCh 257   3525 1982 ECPURF   V00322 ECOPURF
49.92 argT,dedF  2. part of divided sequ                0 C   4176    161      0 JBCh 262  12209 1987 ECHISPUR J02800 ECOHISPUR2
49.99 usg,hisT   -                                   2323 C   2323    470      0 NAR   13   5297 1985 ECHIST1  X02743 ECOHIST1
50.01 pdxB,usg1  div, pdxB = usg2                    1500 C   1500      1      0 JBac 171   6084 1989 ECPDXB   M29962 ECOPDXB
50.20 fabB       -                        F042.2     1748 T      1   1748   1748 CRC   53    357 1988 ECFABB   M24427 ECOFABB
50.40 mepA       -                                   1765 T   1765      1   3129 MoMB   4    209 1990 ECMEPAMR X16909 ECOMEPAMR
50.42 aroC                        new BB             1690 C   1464      1      0 BJ   251    313 1988 ECAROCX  M33021 ECOAROCX
50.61 fadL       -                                   2197 T      1    298   2197 JBac 173    435 1991 ECFADLA  M60607 ECOFADLA
50.62 fadL       -                                   1899 C      1   1899      0 MoMB   2    363 1988 ECFADL   Y00552 ECOFADL
50.65 tRNA Arg5  new locus for tRNA Arg5              300 T      1    300    300 JMB  212    579 1990 ECTRNAR  X52794 ECOTRNAR
50.90 dsdC       contains M13 sequence               1633 T   1633      1   3342 JBac 170    330 1988 ECDSDAA  M19035 ECODSDAA
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50.91	dsdAC	-		1000	C	281	1989	0	JBac	154	1508	1983	ECDSDA	J01603	ECODSDA
50.93	dsdA	corr		1445	C	0	0	0	JBCh	263	16926	1988	ECDSDA	J01603	ECODSDA
51.10	cscB	-		1369	T	1	1369	1369	Unpub.			1992	ECCSCB	X63740	-
52.00	lysV,valU	& gltX,orf294,62,105,16		1880	T	1	1880	5153	JMB	214	825	1990	ECGLTXVA	X55757	ECOGLTXU
52.04	gltX	reading frame only		1514	C	4	1413	0	JBCh	261	10610	1986	ECGLTX	M13687	ECOUXW
52.05	orf62,105	& alaW, orf167		1862	C	1	1862	0	JMB	214	825	1990	ECGLTXVA	X63977	ECOGLTXU
52.08	tRNA Lys &	tRNA Val 17 bp differ.		542	T	1	542	542	JMB	212	579	1990	ECTRNAVK	X52796	ECOTRNAVK
52.10	lig	-		3195	T	1	3195	3195	Unpub.			1989	ECLIG	M24278	ECOLIG
52.20	cysK &	ptsHI,crr		2596	T	1	2597	4861	JBac	170	3150	1988	ECCYSPTS	M21451	ECOCYSPTS
52.21	orf,cysK &	ptsHI,crr		3144	C	881	3144	0	JBac	170	3827	1988	ECPHOSYS	M21994	ECOPHOSYS
52.30	cysP &	cysTWAM		1291	T	1	5736	5736	JBac	172	3358	1990	ECCYS	M32101	ECOCYS
52.60	bent 111	no neighboring gene		361	T	1	361	361	MGG	226	367	1991	ECBENT111	X63986	ECOBENT111
53.00	dapE	-		2270	T	1	2270	2270	JBac	174	5265	1992	ECDAPE	X57403	ECODAPE
53.20	purC,dapX	2D:purC	B026.3	2060	T	2060	1069	5082	JBac	172	6035	1990	ECPURCA	M33928	ECOPURCA
53.21	nlpB =dapX	-		1366	C	1070	1	0	JBac	173	5523	1991	ECNLB34	X57402	ECONLB34
53.22	dapA	-		1171	C	1131	275	0	JBac	166	297	1986	ECDAPA	M12844	ECODAPA
53.23	orf,bcp	53.3 min region; M37689		2163	C	1	2163	0	JGMi	137	361	1991	ECORF123	M63654	ECOORF123
53.70	upp	-		1001	T	1000	767	6776	EJB	204	51	1992	ECUPPUPT	X57104	ECOUPPUPT
53.71	purMN	-		2043	C	1	2899	0	JBCh	261	10632	1986	ECPURMN	M13747	ECOPURMN
53.73	ppk	polyphosphate kinase		2255	C	462	2255	0	JBCh	267	22556	1992	ECPOKINAS	L03719	ECOPOKINAS
53.74	ppx	exopolyphosphatase		1884	C	36	1884	0	JBCh	268	633	1993	-	L06129	-
53.90	guaAB	- overlay gua-xse HD		1847	T	3531	323	4825	NAR	13	1303	1985	ECGUABA	M10101	ECOGUABA
53.93	xseA	-		1616	C	1	1616	0	JBCh	261	14929	1986	ECXSEA	J02599	ECOXSEA
54.10	hisS	-		1673	T	1673	1	3239	JBCh	260	10063	1985	ECHISS	M11843	ECOHISS
54.12	gcpE	J.Parker		1697	C	1697	107	0	Unpub.			1992	ECGCPE	X64451	S113083
54.20	ndk	within crypt. phage 428		724	T	1	724	724	Gene	105	31	1991	--NDK	0005MK	-
54.60	suhB	-		1017	T	1	1017	1017	JBac	172	2124	1990	ECSUHBA	M34828	ECOSUHBA
54.90	glyA,hmp &	glnB J01620 in Gb		1725	T	1725	146	3634	NAR	11	2065	1983	ECGLYA	V00283	ECOGLYA
54.94	hmp,glnB	4 differences		2054	C	1	2054	0	MGG	226	49	1991	ECHMPGLNB	X58872	ECOHMPGLNB
55.20	purL	new BB		5865	T	1	5865	5865	BiCh	28	2459	1989	ECPURLA	J02848	ECOPURLA
55.40	orf360 &	orf178 & 190; X61396 ?		3000	T	1	3000	3000	MoMB	6	900	1992	--GEF	0002MK	-
55.50	djp,pdxJ	-		1466	T	1307	151	6915	JBac	174	1554	1992	ECPDXJDPJ	M74526	ECOPDXJDPJ
55.52	recO,era	-		1588	C	1590	844	0	JBac	171	3641	1989	ECRECO	M27251	ECORECO
55.55	era	-	G031.0	1020	C	1020	185	0	PNAS	83	8849	1986	ECERA	M14658	ECOERA
55.58	rnc	-		1076	C	1076	1	0	NAR	13	4677	1985	ECRNC1	X02673	ECORNC1
55.61	lepA	-		2220	C	3099	1	0	JBCh	260	7206	1985	ECLEP	K00426	ECOLEP
55.80	nadB,rbaB	put. RNA helicase		10272	T	1	10272	10272	Unpub.			1993	ECRBAB	D13169	-
55.81	nadB	new BB		1724	C	0	0	0	EJB	175	221	1988	ECNADB	X12714	ECONADB
55.83	ung	-		1532	C	0	0	0	JBCh	263	7776	1988	ECUNG01	J03725	ECOUNG
56.20	pss, kgtP	& rrnG,gltW,rsl,clpB		1977	T	1	1925	13532	JBCh	266	5323	1991	ECPSS	M58699	ECOPSS
56.22	kgtP =witA	60 bp missing X53027?		94	C	60	1	0	PNAS	88	3802	1991	--WITA	0015MK	-
56.23	witA	loc. betw. pss & rrnG		1560	C	1560	1	0	JBac	172	4745	1990	ECWITAG	X53027	ECOWITAG
56.25	rrfG, witA	distal end of rrfG		480	C	287	1	0	NAR	18	3056	1990	ECRRFG	X52363	ECORRFG
56.32	spacer	analog rrnF ECRNA8		600	C	120	35	0	N	215	735	1967	ECRN10	X00414	-
56.33	rrlG 23S	RNA analog J01695 in Gb		2904	C	6403	3500	0	JMB	148	107	1981	ECRRNBZ	V00348	ECORGNB
56.34	gltW,rsl	rsl, tRNA Glu2		431	C	431	1	0	JBac	170	1235	1988	ECTGG	M20397	ECOTGG
56.35	rrfG 16S	RNA analog J01695 in Gb		1541	C	3059	2194	0	JMB	148	107	1981	ECRRNBZ	V00348	ECORGNB
56.37	clpB,rrnG	last 1438 bp ?		5684	C	4248	2	0	Unpub.			1989	ECPROT	M29364	ECOPROT
56.38	clpB	only 564 bp in paper		3503	C	1165	1	0	JBac	173	4247	1991	ECCLPB	X57620	-
56.45	fdx	[2FE-2S] ferredoxin		800	T	1	800	800	JBCh	267	11120	1992	ECFDX	M88654	ECOFDX
56.60	tyrA &	pheA,aroF M10431 in Gb	F037.9	4509	T	1	4509	4509	JMB	180	1023	1984	ECTYRA	X02137	ECOTYRA
56.80	rplS L19	-		4586	T	1	4586	4586	EMBO	2	899	1983	ECTRMD	X01818	ECOTRMD
57.40	mprA	-		742	T	1	742	742	JBac	173	3924	1991	ECMPRA	X54151	ECOMPRA
57.60	gabTPD	-		5378	T	1	5378	5378	Unpub.			1992	ECSUSEDEH	M88334	ECOSUSEDEH
57.90	argV,serV	& tRNA Ser3		1200	T	1	1200	1200	JMB	212	579	1990	ECTRNASR	X52797	ECOTRNASR
57.95	stpA	similar to HNS		978	T	1	978	978	NAR	20	6735	1992	ECSTPA	X69210	-
58.00	alaS mRNA	new BB		280	T	1	240	3010	JBCh	256	205	1981	--ALAS	0001MK	-
58.01	alaS	-		500	C	1	500	0	PNAS	77	6531	1980	ECALAS1	J01581	ECOALAS
58.02	alaS	J01581 in Gb	F093.0	2767	C	498	2767	0	Scie	213	1497	1981	ECALAS1	V00254	ECOALAS
58.10	recA	J01672 in Gb	C039.3	1320	T	1	1391	1391	PNAS	77	313	1980	ECRECA	V00328	ECORECE
58.11	recA	J01672 in Gb	C039.3	1374	C	0	0	0	PNAS	77	2611	1980	ECRECA	V00328	ECORECE

Listing 1: *(continued)*

58.20	recN	-		2224	T	1	2224	2224	NAR	15	5041	1987	ECRECN	Y00357	ECORECN
58.22	smpAB	map, overlap unclear		611	T	1	611	611	JBac	173	3271	1991	ECSPROT	X52620	ECOSPROT
58.24	smpB,intX	-		2216	T	1	2216	2216	Unpub.			1992	ECSSRA1	D12501	-
58.30	proU(VWX)	2D:proV	G033.5	4362	T	1	4361	4361	JBac	171	1923	1989	ECPROU	M24856	ECOPROU
58.34	bent 105	next to proV		280	T	1	280	280	MGG	226	367	1991	ECBENT105	X63982	ECOBENT105
58.40	gshI	E.coli B mut		2098	B	0	0	0	NAR	14	4393	1986	ECGSHI	X03954	ECOGSHI
58.50	gutABD =	srlABD		3523	T	1	4770	5454	JBCh	262	5455	1987	ECGUT	J02708	ECOGUT
58.54	gutQ	-		935	C	252	935	0	DNAS	1	141	1990	ECGUTQ	X51361	ECOGUTQ
58.60	ascG	B.Hall/L.Xu		4286	T	1	4286	8051	MBE	9	688	1992	-	ES3119	ascGeco
58.61	hydNA	overlap to ascG unclear		4075	C	310	4075	0	Unpub.			1993	ECHYDA	D14422	-
58.80	hevABCDEFG	& hevH		7650	T	7829	101	16907	MoMB	4	231	1990	ECHEVOP	X17506	ECOHEVOP
58.81	hevOP	-		211	C	0	0	0	MoMB	4	13	1990	ECHEVOP	X17506	ECOHEVOP
58.83	hypABCD	hydrogenase isoenzyme		3793	C	1	3720	0	MoMB	5	123	1991	ECHYP	X54543	ECOHYP
58.84	fhlA	fhlB at 95.4 div.seq.		2443	C	210	2382	0	JBac	172	4798	1990	ECFHLA	M58504	ECOFHLA
58.87	mutS	=fdv	E093.0	3327	C	44	3327	0	Unpub.			1991	ECMUTS	M64730	ECOMUTS
59.00	rpoS	new sigma 38 factor		1642	T	1	1642	1642	Unpub.			1992	ECSIGMA38	D13548	ECOSIGMA38
59.04	katF =rpoS	correction		1029	C	0	0	0	Unpub.			1992	ECKATFWT	Z14969	-
59.10	pcm	protein carboxyl methyl		1145	T	1	1145	1145	JBCh	266	14562	1991	ECPCM	M63493	ECOPCM
59.20	cysCND,iap	-		3821	T	3821	336	5987	JBCh	267	10405	1992	ECCYSDNC	M74586	ECOCYSDNC
59.24	iap	conflict last bp = C		1664	C	332	1664	0	JBac	169	5429	1987	ECIAP	M18270	ECOIAP
59.25	iap	14 times 29 bp repeat		1465	C	1	1168	0	JBac	171	3553	1989	M27059	M27059	M27059
59.30	cysIH	cysI,PAPS-reductase		2866	T	1	2866	2866	Unpub.			1991	ECCYSH	Y07525	ECOCYSH
59.32	cysJ	Y07525 in Gb		355	T	1	355	355	Gene	122	17	1992	ECCYSJ	M65058	ECOCYSH
59.33	cysJI	E.coli B prom (5939bp)		324	B	1	2089	5939	JBac	171	130	1989	ECCYSJ01	M23008	ECOCYSJIHA
59.35	cysJIH	E.coli B		3876	B	27	3876	0	JBCh	264	15726	1989	ECCYSJIH	J05057	ECOCYSJIHA
59.75	pyrG next	to 6 times 29 bp repeat		1531	T	1	1531	1531	JBac	171	3553	1989	M27060	M27060	M27060
59.80	pyrG	acc. K.Rudd		2442	T	1	2442	10424	JBCh	261	5568	1986	ECPYRG	M12843	ECOPYRG
59.81	mazG	G.Glaser/M.Cashel		1059	C	1	1059	0	Unpub.		K.Rudd	1991	-	ES3057	mazGeco
59.82	relA	map		2858	C	1	2858	0	JBCh	263	15699	1988	ECRELA	J04039	ECORELA
59.83	relA	G.Glaser/M.Cashel		1011	C	1	1004	0	Unpub.		K.Rudd	1991	-	ES3082	relAeco
59.84	barA	-		3060	C	1	3060	0	MoMB	6	799	1992	ECBARA	D10888	ECOBARA
60.20	metZ	tRNA met		344	T	1	344	344	Gene	67	49	1988	ECTGM1Z	M21680	ECOTGM1Y
60.30	fucO	-		1690	T	0	0	8901	JBac	171	3754	1989	ECFUCO	M27177	ECOFUCO
60.32	fucAPIKR	-		8901	C	1	8901	0	NAR	17	4883	1989	ECFUCOSE	X15025	ECOFUCOSE
60.60	argA &	-		1575	T	1	1571	16364	NAR	15	10586	1987	ECARGA	Y00492	ECOARGA
60.62	recD	-		2160	C	2160	361	0	NAR	14	8583	1986	ECRECD	X04582	ECORECD
60.63	recB	-		3960	C	3960	361	0	NAR	14	8573	1986	ECRECB	X04581	ECORECB
60.64	ptr	-	G095.0	3120	C	3120	1094	0	NAR	14	7695	1986	ECPTR	X06227	ECOPTR
60.65	ptr	-	G095.0	1171	C	1171	191	0	Gene	54	185	1987	ECPTR31	M17095	ECOPTR31
60.66	thyA,recC	& ptr,recDC,argA		6000	C	5992	756	0	NAR	14	4437	1986	ECRECC	X03966	ECORECC
60.67	thyA	16 bp linker deleted		1147	C	1155	8	0	PNAS	80	4914	1983	ECTHYA	J01710	ECOTHYA
61.05	mutH	-		790	T	1	790	790	NAR	15	3073	1987	ECMUTH	Y00113	ECOMUTH
61.10	bent 107	next to mutH		316	T	1	316	316	MGG	226	367	1991	ECBENT107	X63984	ECOBENT107
61.15	aas	-		3186	T	1	3186	3186	Unpub.			1993	ECAAS	L14681	-
61.35	galR	J01614 in Gb		1150	T	1	1150	6097	PNAS	79	2427	1982	ECGALR	V00280	ECOGALLYS
61.36	lysR,orfX	-		1854	C	1151	3231	0	JMB	168	333	1983	ECGALLYS	J01614	ECOGALLYS
61.37	lysA	-		2346	C	0	0	0	JMB	168	321	1983	ECGALLYS	J01614	ECOGALLYS
61.38	araE	-		2866	C	2866	1	0	JBCh	263	8003	1988	ECARAEA	J03732	ECOARAEA
62.00	glyU	Gly-tRNA		464	T	1	464	464	AMbP	35	175	1986	ECTGG1	M54893	ECOTGG1
62.20	herC	-	D058.5	1832	T	1832	1	6279	PNAS	85	5620	1988	ECHERC	J03795	ECOHERC
62.23	prfB (RF2)	map; last 16 bp artific		1440	C	1181	1	0	PNAS	82	3616	1985	ECRF2X	M11520	ECORF2X
62.25	recJ	-		3772	C	3266	1	0	JBac	173	353	1991	ECRECJXP	M54884	ECORECJXPR
62.60	gcvT	T-protein		1823	T	1	1620	2136	Unpub.			1992	ECTPRO	M97263	ECOTPRO
62.61	gcvH	H-protein		516	C	1	516	0	Unpub.			1991	ECGCVH	M57690	ECOGCVH
62.80	sbm,iciA	second sbm gene ?		6055	T	6055	299	7447	JBac	174	5763	1992	ECSERAICI	X66836	ECOSERAICI
62.82	serA	-		1233	C	1233	1	0	JBCh	261	12179	1986	ECSERA	N00029	-
62.83	serA	-		545	C	457	1	0	JBac	173	5944	1991	ECSERAP	M64630	ECOSERAP
62.90	ssr	-		954	T	1	954	954	JBac	161	1162	1985	ECSSR	M12965	ECOSSR
63.00	visBC,pep2	includes flanking seq.		4948	T	1	4948	4948	JBac	174	7352	1992	ECPUV	D90281	ECOPUV
63.40	fda, pgk &	new BB		8029	T	1	8029	8029	MoMB	3	723	1989	ECFDAPGK	X14436	ECOFDAPGK
63.55	tkt	transketolase		2441	T	2441	1	2441	Unpub.			1992	ECTKT	X68025	ECOTKT

63.57	cmtAB	crypt.mannitol transp.		2095	T	1	2095	2095	BioE	9	S93	1993	-	-	-
63.60	speB	additional sequences		1090	T	2457	1	6529	JBac	174	758	1990	ECSPEAA	M32363	ECOSPEAA
63.61	speB	near speA,metK		1371	C	0	0	0	JBac	172	538	1990	ECSPEAA	M32363	ECOSPEAA
63.62	speBA,metK	-		3236	C	2887	1	0	JBac	172	4631	1990	ECSPEA	M31770	ECOSPEA
63.63	metK	-	C044.6	1462	C	278	1462	0	JBCh	259	14505	1984	ECMETK	K02129	ECOMETK
63.70	endA	-		1557	T	1	1557	1557	Unpub.			1992	ECENDAG	X65169	ECOENDAG
63.75	gshII	E.coli B		1474	B	1	1474	1474	NAR	12	9299	1984	ECGSHII	X01666	ECOGSHII
63.80	ansB	ansA maps at 39.10		1522	T	1	30	1673	JBac	172	1491	1990	ECLASNII	M34277	ECOLASNII
63.81	ansB	-		1643	C	1	1643	0	Gene	91	101	1990	ECANSBA	M34234	ECOANSBA
63.90	micA =mutY	A/G spe. glycosylase		2293	T	1	2293	2293	JBac	173	1902	1991	ECMICA	M59471	ECOMICA
64.00	pheV	-		487	T	1	487	487	NAR	13	3699	1985	ECPHEV	X02480	ECOPHEV
64.10	nupG	regulatory region		113	T	1	24	3775	EJB	190	547	1990	ECNUPGP	X55813	ECONUPGP
64.11	nupG	-		1486	C	1	1486	0	EJB	168	385	1987	ECNUPG	X06174	ECONUPG
64.12	speC,crp	crp 2.strand ? 2D:speC	F080.0	2330	C	2264	1	0	Unpub.			1990	ECSPEC	M33766	ECOSPEC
64.30	kpsM	E.coli K1 polysialic ac		797	K	1	797	1449	JBac	173	4603	1991	ECKPSM	M57382	ECOKPSM
64.32	kpsT	overlaps kpsM		676	K	5	676	0	JBac	173	4603	1991	ECKPST	M57381	ECOKPST
65.00	exbBD	overlay met-exb HD		2195	T	2195	830	3246	JBac	171	5117	1989	ECEXBBD	M28819	ECOEXBBD
65.01	metC	-	G043.0	1880	C	1	1880	0	PNAS	83	867	1986	ECMETC	M12858	ECOMETC
66.00	ribB	-		1437	T	1	1437	1437	JBac	0	0	1992	ECRIBB	X66720	ECORIBB
66.40	plsC,sufI	-		1403	T	1403	92	3596	MGG	232	295	1992	ECPLSC	M63491	ECOPLSC
66.41	parC	M37832		2284	C	2284	1	0	Cell	63	393	1990	ECPARC	M58408	ECOPARC
66.50	parE	M37833		1870	T	1	1870	1870	Cell	63	393	1990	ECPARE	M58409	ECOPARE
66.60	tolC	corr		2096	T	1	1780	7816	NAR	18	5547	1990	ECTOLCMP	X54049	ECOTOLCMP
66.64	luxH	& orfDACB		5058	C	1	5068	0	BBA	1130	227	1992	ECLUXH	M77129	ECOLUXH
66.65	htrP =luxH	359 bp less in paper		1993	C	968	1	0	JBac	173	5999	1991	ECHTRP	M64472	ECOHTRP
66.80	cca	-		2257	T	1	2257	2257	JBCh	261	6444	1986	ECCCA	M12788	ECOCCA
66.90	rpsU S21	-		255	T	1	3930	8989	MGG	195	391	1984	ECRPSU01	M16194	ECORPSU
66.92	rpsU &	dnaG,rpoD		2600	C	1	5059	0	NAR	9	2889	1981	ECRPSRPO	J01687	ECORPSRPO
67.05	tRNA Ile2	new locus for tRNA Ile2		200	T	1	200	200	JMB	212	579	1990	ECTRNAI	X52800	ECOTRNAI
67.80	ebgRABC	flanking seq.		4983	T	1	4983	4983	G	123	635	1989	ECEBG	X52031	ECOEBG
67.91	uxaC	exuT new BB		318	T	1	318	318	FEMS	33	205	1986	ECUXEX	M35280	ECOUXEX
68.10	tdcRABC &	-		2044	T	6295	1	10619	NAR	17	3994	1989	ECTDCRAB	X14430	ECOTDCRAB
68.19	rnpB,orf12	-		4435	C	4324	1	0	JBac	173	1813	1991	ECRNPBW	D90212	ECORNPBW
68.40	sohA	supp.htrA		828	T	1	233	1160	JBac	172	1587	1990	ECSOHA	M30178	ECOSOHA
68.41	prlF	-		927	C	1	927	0	JBac	172	185	1990	ECPRLF	M32358	ECOPRLF
68.80	mtr,deaD &	pnp,rpsO,infB,nusA,metY		2594	T	2594	2092	16045	JBac	173	4133	1991	ECMTRA	M58338	ECOMTRA
68.81	mtr,deaD	pnp,rpsO,infB,nusA,metY		1868	C	1867	1	0	JBac	173	108	1991	ECMTR	M59862	ECOMTR
68.82	deaD,orf	-		6	C	2508	1	0	JBac	173	3291	1991	ECDEAD	M63288	ECODEAD
68.83	pnp,rpsO	2D:pnp	C078.0	3030	C	3030	268	0	JBCh	262	63	1987	ECRPS15	J02638	ECORPSOP
68.88	nusA,infB	gene and mRNA corr BB		903	C	5423	211	0	PNAS	81	409	1984	ECNUSA2	K01175	ECONUSA
68.96	metY flank	3' flanking sequence		800	C	800	1	0	JBac	172	2336	1990	ECMETY	M28401	ECOTGMETY
68.98	argG	-		1344	C	337	1344	0	Gene	95	99	1990	ECARGGA	M35236	ECOARGGA
69.00	folP,leuU	& yhbF		3413	T	1	3413	3413	Unpubl.			1993	ECFOLPA	L12968	-
69.02	leuU	tRNA Leu2		300	C	0	0	300	JMB.	212	579	1990	ECTRNAL	X52801	ECOTRNAL
69.10	greA	-		1744	T	1744	1	3030	NAR	18	6443	1990	ECGREAG	X54718	ECOGREAG
69.12	dacB	2. entry X60038		1884	C	599	1884	0	FEMS	78	213	1991	ECDACB	X59460	ECODACB
69.30	ftsJH	cell cycle control		2958	T	1	2958	2958	JBac	175	1344	1993	ECFTSHJA	M83138	ECOFTSHJA
69.40	rplU L21	-		2529	T	1	2529	2529	Unpub.			1992	ECRPLRPM	D13267	ECORPLRPM
69.45	murZ	UDP-GLcNAC transferase		1829	T	1	1829	1829	JBac	174	5748	1992	ECMURZ	M92358	ECOMURZ
69.50	nlp	ner like protein		1342	T	1	1342	1342	JBac	171	5222	1989	-	-	-
69.60	ntrA,rpoN	three orf, map		3509	T	1	3509	3509	JBac	175	1550	1993	ECRPON	D12938	-
69.61	rpoN	sigma 54 factor		1434	C	0	0	0	Cell	62	945	1990	ECSIG54	M57612	ECOSIG54
69.70	arcB	-		300	T	1	274	2808	JBac	174	3972	1992	ECARCBA	M90703	ECOARCBA
69.71	arcB	-		2534	C	1	2534	0	MoMB	4	715	1990	ECARCB	X53315	ECOARCB
69.90	gltE =	aspB; gltB ?		6292	T	1	6292	6292	Gene	60	1	1987	ECGLTB	M18747	ECOGLTB
70.00	gltF, orf	-		2315	T	1	2315	2315	MoMB	6	2733	1992	ECGLTF	M74162	ECOGLTF
70.02	gltB= psiQ	-		48	T	1	48	48	JBac	172	3191	1990	ECALPHOR	M33740	ECOALPHOR
70.03	gltB= psiQ	-		39	T	1	39	39	JBac	172	3191	1990	ECALPHOU	M33743	ECOALPHOU
70.04	gltD= psiQ	-	F050.4	52	T	1	52	52	JBac	172	3191	1990	ECALPHOO	M33737	ECOALPHOO
70.15	sspA	-	D027.1	1616	T	1	1616	1733	NAR	15	1153	1987	ECSSPG	X05088	ECOSSPG
70.16	sspB	-		534	C	419	534	0	Gene	109	21	1991	ECSSPB	M69028	ECOSSPB

Listing 1: (*continued*)

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70.30 nanA     = npl new BB D00067 in Gb            1243 T        1   1243   1243 AgrB  50   2155 1986 ECNANAA  M20207 ECONANA
70.50 rpsI,rplM                length BB            1159 T       26   1184   1159 MGG  198    279 1985 ECRPSI   X02130 ECORPSI
70.70 mdh,argR   -                                  1046 T        0      0   3028 NAR   15   4993 1987 ECMDH1   Y00129 ECOMDH1
70.72 mdh argR                    new BB            2470 C     2470    369      0 AcMB 149     36 1987 M24777   M24777 M24777
70.73 argR       = xerA           new BB             926 C        1    926      0 EMBO   7   4389 1988 ECXERA   X13968 ECOXERA
70.80 prlC       -                                  2672 T        1   2672   2672 JBac 174   5881 1992 ECPRLC   M93984 ECOPRLC
71.00 mreD,orfEF orfE, orfF                         2314 T     2314    310   5590 Gene 106    135 1991 ECMRED   X57166 S65051
71.02 mreCD      bad name in Gb                     1965 C     1965      1      0 JBac 171   6511 1989 ECMREBCD M31792 ECOMERBCD
71.03 mreB     & mreCD; mreB = envB                 2105 C     1621      1      0 JBac 170   4619 1988 ECMREB   M22055 ECOMREB
71.10 fabE       = fabG in M83198                   4413 T        1   4180   6084 JBCh 267    855 1992 ECACOAC  M80458 ECOACOAC
71.15 fabG       bad name fabG (24.40)              1750 C        0      0      0 PNAS  88   9730 1991 ECFABG   M79446 ECOFABG
71.16 panF       pantothen permease                 1904 C        1   1904      0 JBac 172   3842 1990 ECPANF   M30953 ECOPANF
71.60 fis,orf2,3 -                                  2467 T        1   2467   2467 JBac 174   8043 1992 ECFISORFSM95784 ECOFISORFS
71.70 bending    site 10;49 bp misplaced             222 T        1    173    173 NAR   15   6827 1987 ECBENT10 X05963 ECOBENT10
71.81 rrlD,rrfD, thrV,rrfD  J01693 in Gb             667 T      667    471   5761 NAR    8   3793 1980 ECRNA6   V00334 ECORNA6
71.82 RNA 7 S    -                                   165 C        0      0      0 BiCh  23   2952 1984 ECAP     K02180 ECORRAP
71.83 rrfD, thrV GGU                                 360 C      302      1      0 NAR   20   4089 1992 EC5SRTHR D12500 ECO5SRTHR
71.84 rrlD,rrfD  -                                     0 C      169    134      0 NAR    8   3793 1980 ECRNA6   V00334 ECORNA6
71.85 rrlD   23S RNA analog J01695 in Gb            2903 C     6403   3500      0 JMB  148    107 1981 ECRRNBZ  V00348 ECORGNB
71.87 rrsD tRNA  ile ala tRNA:A250                   545 C      437      1      0 JBCh 254   3264 1979 ECRGNX2  K00763 ECORGNX2
71.88 rrsD   16S RNA analog J01695 in Gb            1541 C     2959   1512      0 JMB  148    107 1981 ECRRNBZ  V00348 ECORGNB
71.92 rrnD       operon     J01692 in Gb             472 C      424      7      0 Cell  17    225 1979 ECRGNX1  J01700 ECORGNDS1
71.93 rrnD       upstream sequence                    92 C       19      1      0 Unpub.          1992 ECRRNDUS X67682 ECORRNDUS
72.00 aroE       -                                   819 T        1    819    819 BJ   249    319 1988 ECAROE1  Y00710 ECOAROE1
72.05 aroE,rplQ  intergenic M11148 in Gb             242 T        1    242    242 NAR   12   5813 1984 ECAROE   X00767 ECOAROI
72.10 fms,fmt    -                                  2256 T        1   2256   2256 JBac 174   4294 1992 ECFMT    X63666 ECOFMT
72.15 trkA, orf  KR                                 1788 T        1   1788   1788 Unpub.          1991 ECTRKAG  X52114 ECOTRKAG
72.40 rplQ   L17 = neaA                   J014.9    3154 T     3154    329  14392 NAR   13   3891 1985 ECRPA    X02543 ECORPA
72.46 rpsM   S13 -                                   759 C      759    654      0 JBCh 255   4653 1980 ECRPLP2  M12432 ECORPLP2
72.51 rplO   L15 -                                  5922 C     5922    224      0 NAR   11   2599 1983 ECSPC    X01563 ECORPLN
72.66 rpmC   L29 901 bp not det,here BB   J011.1    4520 C     5421    902      0 NAR   13   4521 1985 ECRPOS10 X02613 ECORPOS10
72.75 rpsJ   S10 J01680 in Gb             J012.1    1241 C     1241      1      0 Cell  26    205 1981 ECRPSL   V00344 ECORPSL
72.95 bfr, gp24' & gp64   map        bfr  C014.3    1350 T        1   1350   1350 JBac 171   3940 1989 ECBFR    M27176 ECOBFR
73.00 tufA       ca.100 bp gap                       200 T      200      1    200 Gene  12     25 1980 ECSTR4   J01691 ECOSTR4
73.05 tufA       -                        E042.0    1374 T     1374     70   4769 Gene  12     25 1980 ECSTR3   J01690 ECOSTR3
73.07 fusA                     length BB  D084.0    2076 C     2145    310      0 NAR   12   2181 1984 ECFUSG   X00415 ECOSTRA
73.08 rpsG   S7  K12        J01689 in Gb             405 C      405      1      0 JBCh 255   4660 1980 ECSTR2   V00356 ECOSTR2
73.10 rpsG   S7  -                                   281 C        4    201      0 Gene 120     93 1992 ECRPSG   X64592 -
73.12 rpsL   S12 -                                   365 C     1016      1      0 Cell  15    215 1978 ECSTR11  J01688 ECOSTR1
73.50 crp, orf   -                                   783 T      783    196   1880 BBA 1129    109 1991 ECCRPDDNAX61919 ECOCRPDDNA
73.51 crp        -                                  1127 C        7   1127      0 NAR   10   1363 1982 ECCRP    J01598 ECOCRP
73.53 crp        -                                   269 C       99    269      0 JBac 169    654 1987 ECCRP3B  M15200 ECOCRP3B
73.80 envCD      -                                  6792 T        1   6792   6792 MGG  230    230 1991 ECENVCD  X57948 ECOENVCD
74.00 argD (dtu) -                                  1221 T     1221      1   3923 Gene  90     69 1990 ECARGD   M32796 ECOARGD
74.01 pabA     & orf,utu,dtu                        2059 C     2008      1      0 JBac 172    397 1990 ECPABAA  M32354 ECOPABAA
74.04 fic      & orf190,orf77                       2496 C      694      1      0 JBac 171   4525 1989 ECFIC1   M28363 ECOFIC1
74.20 nirBDEC  & cysG last 18 bp artf MK            5618 T        1   5596   5596 EJB  191    315 1990 ECNIRBC  X14202 ECONIRBC
74.23 cysG,orf   E.coli B                           5280 B     2664   5280      0 JBac 173    325 1991 ECCYSAA  M64606 STYCYSAA
74.30 trpS,dam   entire operon sequence             8297 T     8297      1   8297 Unpub.          1993 ECDAMOPRAZ19601 -
74.32 trpS       J01716 in Gb  length BB  H037.0    1005 C        0      0      0 JBCh 257   6132 1982 ECTRPSZ  V00371 ECOTRPSZ
74.35 dam,orf    76 bp artificial subtr.            1058 C        0      0      0 NAR   11    837 1983 ECDAM    J01600 ECODAM
74.36 dam,orf  & aroB                               1560 C        0      0      0 MGG  217     85 1989 ECURF743 X15162 ECOURF743
74.37 aroB       first 8 bp artificial              1636 C        0      0      0 FEBS 200     11 1986 ECAROB   X03867 ECOAROB
74.38 aroK       incl. dam promoter                 2225 C        0      0      0 JBac 174    525 1992 ECAROK   M76389 ECOAROK
74.60 mrcA       identical BglII ?                  2764 T        1   2764   2764 EJB  147    437 1985 ECPONA   X02164 ECOPONA
74.80 pckA       severe differences !     E056.0    1860 T        1   1673   4285 JBac 172   7151 1990 ECPCKA   M59823 ECOPCKA
74.83 envZ                       corr BB            1603 C     1511      1      0 JBCh 257  13692 1982 ECENVZ   J01606 ECOOMPB
74.85 ompR,envZ  = ompB          corr BB            1288 C     1100      2      0 JBCh 257  13685 1982 ECOMPB   J01656 ECOOMPB
75.01 bioH       -                                  2614 T        1   2614   2614 Unpub.          1989 ECBIOH   X15587 ECOBIOH
75.15 malQP      -                                  2866 T     2866      1   8703 MoMB   2    473 1988 ECMALQP  M32793 ECOMALQP
75.16 malPT,zhg  corr BB    X02003 in Gb            2437 C     1900      1      0 ZNfC  42    394 1987 ECMALP2  X06791 ECOMALP
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75.17	malP	length BB		1901	C	639	1	0	N	313	500	1985	ECMALP1	X02003	ECOMALP
75.20	malT	-		3508	C	211	3508	0	Gene	42	201	1986	ECMALT	M13585	ECOMALT
75.50	glpRGED	X07520 in Gb 2D:glpR	G028.0	2913	T	2913	1	15819	NAR	16	7732	1988	ECGLPRZ	M54940	ECOGLPREG
75.52	glgDP	flavoenzyme		2838	C	421	2267	0	AgrB	53	1135	1989	ECGLPD01	D00425	ECOGLPDA
75.54	glgPACXB &	asd, 21 bp difference		2580	C	2580	1	0	JBCh	263	13706	1988	ECGLGPA	J03966	ECOGLGPA
75.57	glgA	-		1601	C	1505	1	0	JBCh	261	16256	1986	ECGLGA	J02616	ECOGLGA
75.62	glgX	-		2047	C	3208	1	0	Gene	70	363	1988	ECGLG	J01616	ECOGLG
75.63	glgB	-		2559	C	2349	258	0	JBCh	261	8738	1986	ECGLGBA	M13751	ECOGLGBA
75.64	asd	-		1674	C	1674	1	0	EMBO	1	379	1982	ECASDX	V00262	ECOASD
75.80	ggt &	ugp,liv,htp,rpo ATGA		2148	T	2148	1	20573	JBac	171	5169	1989	ECGGT	M28722	ECOGGT
75.81	ugpQ,orfQ	2.determination		1222	C	1181	20	0	MGG	226	321	1991	ECUGPQQ	X56908	ECOUGPQQ
75.83	ugpBAEC	-		4717	C	4558	325	0	MoMB	2	767	1988	ECUGP	X13141	ECOUGP
75.91	liv Operon	-		7586	C	8703	155	0	JBCh	265	11436	1990	ECLIVHMG	J05516	ECOLIVHMGF
75.97	ftsXEY	-		4480	C	4480	1	0	MGG	205	134	1986	ECFTSYEX	X04398	ECOFTSYEX
77.20	gor	-	F045.6	1500	T	1	1500	1500	BiCh	25	2736	1986	ECGOR	M13141	ECOGOR
77.40	rhsB	orfB2, orf-H		7673	T	1	7673	7673	Unpub.			1992	ECRHSBAA	L02370	ECORHSBAA
77.60	gadA	map and sequence		1421	T	1	1421	1421	JBac	174	5820	1992	ECGADA	M84024	ECOGADA
78.80	cspA	cold shock prot.A	F010.6	1205	T	1	1205	1205	PNAS	87	283	1990	ECCSPA	M30139	ECOCSPAA
79.00	dppA = fpp	dipeptide transport pr.		1950	T	1	1950	1950	JBac	173	234	1991	ECFPP	M35045	ECODPPA
79.20	pro tRNA	-		1085	T	1	1085	1085	NAR	13	3213	1985	ECTRNPRO	X02434	ECOTGPRO
79.30	tag,bisC	-		869	T	1	869	3894	JBCh	261	15761	1986	ECTAG3M	J02606	ECOTAG
79.32	bisC	overlay KR		3337	C	3025	1	0	JBac	172	2194	1990	ECBISCAS	M34827	ECOBISCASD
79.50	glyS	-	E077.5	3153	T	1	3333	3333	JBCh	258	10637	1983	ECGLYS	J01622	ECOGLYS
79.70	xylAB	K01996 in Gb		4175	T	1	4175	4175	AEMb	47	15	1984	ECXYLIK	X04691	ECOXYLABA
80.30	malS,bax	-		3617	T	1	3617	4464	JBCh	267	5148	1992	ECMALS	X58994	ECOMALS
80.31	avtA	map BB		1752	C	847	1	0	NAR	15	9461	1987	ECAVT	Y00490	ECOAVT
80.40	selA	selenocysteine synthete		1451	T	1	1385	3385	JBCh	266	6318	1991	ECSELA	M64177	ECOSELA
80.41	selB	ATGA overlap		2000	C	1	2000	0	N	342	453	1989	ECSELB	X16644	ECOSELB
80.50	rhsA	-		9234	T	1	9234	9234	JBac	172	446	1990	ECRHSA	M29716	ECORHSA
80.60	mtlOP	corrected by 80.71		300	T	1	299	3638	MoMB	2	405	1988	ECMTLOP	X06793	ECOMTLOP
80.62	mtlA	K00051 in Gb		2164	C	60	2162	0	JBCh	258	10761	1983	ECMTLA	V01503	ECOMTLB
80.63	mtlDA	corrected by 80.74		1407	C	172	1407	0	MoMB	2	405	1988	ECMTLD	X06794	ECOMTLD
80.80	cysE	-		1135	T	1	2	1398	JGMi	133	515	1987	ECCYSE	M15745	ECOCYSE
80.81	cysXE	overlap on 2.strand		1396	C	1	1396	0	BBRC	167	948	1990	ECCYSXE	M34333	ECOCYSXE
81.00	secB	revers overlap of gene		593	T	1	593	593	Gene	75	167	1989	ECSECB	M24489	ECOSECB
81.10	tdh	length BB		1665	T	3563	1	3563	JBCh	264	5226	1989	ECKBLTDH	X06690	ECOKBLTDH
81.21	rfaD	commun EcoRI ?		2037	T	1	2037	245209	JBac	172	4652	1990	ECRFADA	M33577	ECORFADA
81.23	rfaFCL	rfa2		3219	C	1	1675	0	Unpub.			1991	ECRFA2	X62530	ECORFA2
81.24	rfaCLKZY	-		4304	C	4304	1	0	JBac	174	4746	1992	ECRFA	M95398	ECORFA
81.25	rfaJIB	-		4100	C	4080	1	0	JBac	174	4736	1992	-	-	-
81.26	rfaPGQ	ATGA overlap		3420	C	3399	794	0	JBac	174	930	1992	ECRFAQPG	M80599	ECOLPOSACR
81.28	kdtA	-		2864	C	1	2434	0	JBCh	266	9687	1991	ECKDTA	M60670	ECOKDTA
81.29	fpg	-		1093	C	1093	670	0	EMBO	6	3177	1987	ECFPG	X06036	ECOFPG
81.30	81.5-84.5			136254	C	1	136254	0	Geno	0		1993	-	L10328	ECOUW82
81.31	rpmB L28	-		764	C	0	0	0	MGG	184	218	1981	ECRPMBG	J01677	ECORPMBG
81.33	radC	-		651	T	651	1	0	NAR	20	366	1992	ECRADC	X63366	ECORADC
81.60	gadS	2D also D046.5	E046.5	852	T	1	852	0	EJB	204	93	1992	ECGLUDE	X63123	ECOGLUDE
81.90	dut,orf &	pyrE, atte X01714 in Gb		1613	T	1	2568	0	EMBO	2	967	1983	ECDUTPYR	V01578	ECOPYREA
81.92	pyrE	-		1113	C	759	353	0	EJB	135	223	1983	ECPYRE	X00781	ECOPYRE
81.94	orfXY,orfE	new BB		2375	C	1	2375	0	MoMB	3	393	1989	ECRFPYRE	X14235	ECORFPYRE
82.10	spoR	C.Bengra/M.Cashel		1531	T	1	1531	0	Unpub.		K.Rudd	1991	-	ES3104	spoReco
82.11	rpoZ,spoT	-		764	T	1	278	0	Gene	48	33	1986	ECOMEGA	M15266	ECOOMEGA
82.13	rpoZ,spoT	& orf M24503 in Gb		3171	C	1	3171	0	JBCh	264	15074	1989	ECSPOT	J04976	ECOSPOT
82.15	spoU,recG	bad name in EMBL		3041	C	429	3041	0	JBac	173	6837	1991	ECRCG	X59550	ECORCG
82.17	gltS	-		1881	C	1141	1	0	MGG	225	379	1991	ECGLTS	X17499	ECOGLTS
82.18	gltS	M.Calman/M.Cashel		1928	T	1	1928	0	Unpub.		K.Rudd	1991	-	ES3127	gltSeco
82.19	gltS	E.coli B, 385 bp pBR322		2971	B	452	386	0	JBCh	265	21704	1990	ECBGLTS	D00626	ECOBGLTS
82.40	selC	seleno tRNA		233	T	1	233	0	N	331	723	1988	ECSELC1	X17419	ECOSELC1
82.50	nlpA	-		1689	T	1	1689	0	JBCh	261	2284	1986	ECLP28	M12163	ECOLP28
82.60	uhpTCBA &	ilvBN		5403	T	5403	1	0	JBac	169	3556	1987	ECUHP	M17102	ECOUHP
82.64	ilvBN	-		2462	C	2248	1	0	NAR	13	3995	1985	ECILVBPR	J01633	ECOILVBPR

Listing 1: *(continued)*

83.25	ibpAB	heat shock genes		2886	T	1	2886	0	JBac	174	6938	1992	-	-	-
83.42	gyrB	-		1498	T	4931	1	0	NAR	12	6389	1984	ECGYRBF	X04341	ECORECFA
83.52	dnaN	-		3278	C	3411	696	0	Gene	28	159	1984	ECDNAAN	J01602	ECODNAAOP
83.55	rnpA	-		1069	C	1	1069	0	Gene	38	85	1985	ECRNPA	M11056	ECORNPA
83.70	thdF	-		1925	T	1925	1	0	JBac	173	6018	1991	ECTHDF	S57109	S57109
83.71	tnaA corr	antitermination site	G046.5	623	C	562	623	0	JBac	164	731	1985	ECTNAAA	M11990	ECOTNAAA
83.75	tnaAC	-		1994	C	604	2044	0	JBac	147	787	1981	ECTNAA	K00032	ECOTNAA
83.76	tnaB	similar to mtr		1688	C	1	1688	0	JBac	173	3231	1991	ECTNAB	M59914	ECOTNAB
83.95	bending	site 20;261bp misplaced		473	T	262	473	0	NAR	15	6827	1987	ECBENT20	X05968	ECOBENT20
84.00	bglR	-		5270	T	5270	1	0	JBac	169	2579	1987	ECBGLO	M16487	ECOBGLO
84.05	phoU	pstBAC		3730	C	4656	295	0	JBac	161	189	1985	ECPHOS	K01992	ECOPHOS
84.15	gid,unc &	glmS,phoS corr atpD	B046.7	14106	C	14526	1	0	BJ	224	799	1984	ECUNC	X01631	ECOUNCC
84.41	gidA,oriC	& fvd,asnCA		4012	C	996	4012	0	Gene	24	265	1983	ECORIASN	K00826	ECOORIASN
84.46	trkD,rbsD	new name for trkD: kup		2367	T	1	2367	0	Unpub.			1993	ECKUPRBS	X68551	-
84.50	rbsBACK	-		5820	T	1	5820	0	Unpub.			1987	ECRBS	M13169	ECORBS
84.54	rbsR	C.Mauzy/M.Hermudson		377	C	1	377	0	Unpub.		K.Rudd	1991	-	ES3081	rbsReco
84.66	kdsB	-	C032.7	1308	T	1	1308	0	JBCh	261	15831	1986	ECKDSB	J02614	ECOKDSB
84.69	rrnC	ribosomal operon C		682	T	1	664	0	PNAS	82	5073	1985	ECRGNC	M10739	ECORGNC
84.70	rrsC 16S	RNA analog J01695 in Gb		1541	C	1519	3059	0	JMB	148	107	1981	ECRRNBZ	V00348	ECORGNB
84.71	gltU	tRNA glu2, relA1 90.58?		354	C	1	354	0	JBac	170	1235	1988	ECTGGA	M20398	ECOTGGA
84.72	rrlC 23S	RNA analog J01695 in Gb		2903	C	3500	6495	0	JMB	148	107	1981	ECRRNBZ	V00348	ECORGNB
84.75	rrfC,aspT,	trpT J01696 in Gb		500	C	1	163	0	JBCh	254	12725	1979	ECRRNC	V00349	ECORGNX3
84.79	84.5-86.5	min; UW-EC genome proj		91400	C	7	91400	0	Scie	257	771	1992	ECUW85U	M87049	ECOUW85U
84.80	orfI,II	intergenic region		4900	C	0	0	0	Gene	97	21	1991	ECRRNILV	M37337	ECORRNILV
84.86	ilvGMEDAYC	-		574	C	0	0	0	NAR	7	2289	1979	ECILVGE	M10313	ECOILVGE
85.10	hel	-		2671	C	0	0	0	NAR	15	465	1987	ECREPHEL	X04794	ECOREPHEL
85.12	gppA	-		1748	C	0	0	0	Unpub.			1992	ECRNAHLLP	M83316	ECOGPPA
85.13	rhlB	wrong rhlB start (134)		1536	C	0	0	0	NBio	3	886	1991	ECRHLB	X56310	ECORHLB
85.17	trxA	-		1493	C	0	0	0	JBac	166	945	1986	ECTRXA	M12779	ECOTRXA
85.20	rho	-	I048.8	1800	C	0	0	0	NAR	11	3531	1983	ECRHO	J01673	ECORHO
85.45	rfe,orf	-		2543	C	0	0	0	JBCh	267	746	1992	ECRFE	M76129	ECORFE
85.70	argX	promoter		187	C	0	0	0	BiCh	30	813	1991	-	-	-
85.71	hisR	his leu1 pro		646	C	0	0	0	JBac	158	934	1984	ECTGRHLP	K01994	ECOTGRHLP
85.73	proM	included in ECUW85U		3734	C	0	0	0	Unpub.		K.Rudd	1991	-	ES3079	proMeco
85.74	hemY			4260	C	0	0	0	NAR	16	9871	1988	ECHEMCD	X12614	ECOHEMCD
85.84	cyaF,cya	newer version of X01653		4310	C	0	0	0	Unpub.			1992	ECCYALOC	X66782	ECOCYALOC
85.85	dapF	-		1308	C	0	0	0	NAR	16	10367	1988	ECDAPF	X12968	ECODAPF
85.86	orf,xerC	-		2500	C	0	0	0	JBac	172	6973	1990	ECXERC	M38257	ECOXERC
85.90	uvrD	corr		2846	C	0	0	0	JBio	99	1579	1986	ECUVRD2	D00069	ECOUVRD2
85.96	bending	site 19		426	C	0	0	0	NAR	15	6827	1987	ECBENT19	X05967	ECOBENT19
86.01	rarD,corA	corr. of M87049		4722	C	0	0	0	Unpub.			1993	ECCORAX	L02122	-
86.02	corA	corr. of M87049		1232	C	0	0	0	Unpub.			1993	ECCRA	L11042	-
86.15	pldA,recQ	-		1319	C	0	0	0	JBio	96	1655	1984	ECPLDA1	X02143	ECOPLDAA
86.17	recQ	-		2695	C	0	0	0	MGG	205	298	1986	ECRECQ	M30198	ECORECQ
86.25	pldB	-		1576	C	0	0	0	JBio	98	1017	1985	ECPLDB	X03155	ECOPLDB
86.31	metE,metH	operator 2D:metE	F088.0	254	C	0	0	0	PNAS	86	4407	1989	--METER	0020MK	-
86.33	metR	-		1013	C	0	0	0	PNAS	87	7076	1990	ECMETR	M37630	ECOMETR
86.40	udp	including unpub. seq.		2479	C	0	0	0	NAR	17	6741	1989	ECUDP	X15689	ECOUDP
86.70	rfaH(sfrB)	= hlyT or sfrB		3591	C	0	0	0	MoMB	6	1003	1992	ECHLYT	X65013	ECOHLYT
87.10	fre	= ubiB		894	C	0	0	0	JBac	173	3673	1991	ECFLRDA	M61182	ECOFLRDA
87.20	fadA	BglII identical ? map	H038.6	1594	C	0	0	0	JBCh	265	10424	1990	ECFADA	J05498	ECOFADBA
87.22	fadAB			3679	C	0	0	0	NAR	18	4937	1990	ECFADAB	X52837	ECOFADAC
87.23	pepQ,orf	-		4151	C	0	0	0	NAR	18	6439	1990	ECPEPQ	X54687	ECOPEPQ
87.24	rrnA ribos	operon A J01694 in Gb		426	C	0	0	0	Cell	17	201	1979	ECRNA2	V00330	ECORGNA
87.25	rrsA 16S	RNA analog J01695 in Gb		1541	C	0	0	0	JMB	148	107	1981	ECRRNBZ	V00348	ECORGNB
87.26	rrnA	ribosomal spacer J01702		241	C	0	0	0	PNAS	75	3593	1978	ECRNA5	V00333	ECORGNDS2
87.31	alaUV &	ileUV tRNAs analogs		545	C	0	0	0	JBCh	254	3264	1979	ECRGNX2	K00763	ECORGNX2
87.32	rrlA 23S	RNA analog J01695 in Gb		2903	C	0	0	0	JMB	148	107	1981	ECRRNBZ	V00348	ECORGNB
87.33	intergenic	region rrfA		247	C	0	0	0	Cell	19	393	1980	ECRGNDS3	K00766	ECORGNDS3
87.35	5S RNA	-		120	C	0	0	0	NAR	6	2453	1979	ECRN10	X00414	ECORRAA
87.40	dsbA = dsf	-		675	T	1	675	675	Cell	67	581	1991	ECDSF	M77746	ECODSF

87.50	polA	J01663 in Gb	F113.0	3190	T	1	4127	4127	JBCh	257	1958	1982	ECPOLA1	J01663	ECOPOLA
87.60	attP2 II	-		478	T	1	478	478	JBac	174	4086	1992	ECBP2ASB	Z11492	ECOBP2ASB
87.62	ogr, D	cryptic phage proteins		378	T	1	378	378	JBac	174	4094	1992	ECDOGR	M81463	ECODOGR
87.70	glnALG	= ntrBC		4311	T	4311	1	4970	NAR	15	2757	1987	ECGLN	X05173	ECOGLN
87.71	glnALG	J01618 in Gb		814	C	659	1	0	MGG	190	171	1983	ECGLNA	V00282	ECOGLNACR
88.00	rhaB	J.Tobin/R.Schleif		2059	T	1	2059	6285	Unpub.		K.Rudd	1991	-	ES3085	rhaBeco
88.01	rhaSR	new BB		2201	C	1	1940	0	JMB	196	789	1987	ECRHAC	X06058	ECORHAC
88.03	rhaTC,sodA	-		1661	C	1661	429	0	JGMi	138	110	1992	ECRHAT	X60699	ECORHAU
88.04	sod(nrdB)	-		1053	C	1	1053	0	NAR	14	4577	1986	ECSOD	X03951	ECOSOD
88.09	sodA ??	second gene ??		1626	T	1	1626	1626	Unpub.			1992	ECNOFEAT	M94879	ECONOFEAT
88.15	fdhE	-		1200	T	1	1200	1200	Gene	97	147	1991	ECFDHE	X16016	ECOFDHE
88.20	cpxA	new BB		1841	T	1	1841	1841	JMB	203	467	1988	ECCPXA01	M36795	ECOCPXA
88.25	bending	site 5; prox. to pfkA		188	T	188	28	4428	NAR	15	6827	1987	ECBENT5	X05960	ECOBENT5
88.26	pfkA	-	F035.8	3304	C	1	3306	0	EJB	149	363	1985	ECPFKA	X02519	ECOCDHA
88.29	tpi	-		1338	C	1	961	0	MGG	195	314	1984	ECTPI	X00617	ECOTPIA
88.40	glpKF	-		1170	T	1	1170	4315	NAR	17	4378	1989	ECGLPF	X15054	ECOGLPF
88.42	glpK	incl. unpubl. material	E048.7	1545	C	129	1550	0	JBCh	263	135	1988	ECGLYK	M18393	ECOGLYK
88.43	glpX,mvrA	additional glp gene		1654	C	12	1637	0	JBac	174	6981	1992	ECGLPXG	Z11767	ECOGLPXG
88.47	mvrA	corrected by Z11767		981	C	885	981	0	JBac	170	2136	1988	ECMVRA	M19644	ECOMVRA
88.80	cytR	-		1384	T	1384	1	3683	NAR	14	2215	1986	ECCYTR	X03683	ECOCYTR
88.82	priA	Ac Nr D00616; 2D:priA	H096.8	2907	C	2299	1	0	PNAS	87	4615	1990	ECPRIAY	M33881	ECOPRIAY
89.00	metJBLF	corr BB		729	T	729	1	8543	JBCh	259	14282	1984	ECMETJA	M12869	ECOMETJA
89.03	metB	-	G040.1	1411	C	240	1411	0	JBCh	258	14868	1983	ECMETLB1	K01546	ECOMETLB1
89.04	metL	J01651 in Gb		2433	C	16	2430	0	JBCh	258	3028	1983	ECMETL	V00305	ECOMETL
89.05	metL	direct continuity		240	C	1	240	0	JBCh	258	14868	1983	ECMETLB2	K01547	ECOMETLB2
89.06	metF	direct continuity		1238	C	1	1182	0	NAR	11	6723	1983	ECMETF	V01502	ECOMETF
89.07	katG	-		2805	C	1	2805	0	JBac	170	4415	1988	ECKATGA	M21516	ECOKATGA
89.20	ppc	ppc 59, ppc 67	F084.0	3106	T	1	3106	3106	JBio	95	909	1984	ECPPCG	X05903	ECOPPCG
89.30	argE	-		1242	T	1242	1	3696	Gene	116	1	1992	ECARGE	X62807	ECOARGE
89.31	argE	-		440	C	34	70	0	NAR	10	8031	1982	ECARGOP1	J01587	ECOARGOP1
89.34	argB	-		2117	C	1	2117	0	Gene	68	275	1988	ECARGBCH	M21446	ECOARGBCH
89.50	bent 101	next to rrnB		184	T	1	184	184	MGG	226	367	1991	ECBENT101	X63978	ECOBENT101
89.60	mor = oxyR	= momR		1500	T	1	1500	1500	JGMi	136	455	1990	ECMOR	M34102	ECOMOR
89.64	mor, oxyR	S.Warne		811	T	1	811	811	Unpub.		K.Rudd	1991	-	ES3061	mor-eco
89.68	udhA,orfAB	-	G039.6	2465	T	1	2221	33806	PNAS	89	3995	1991	ECUDHATRM	X66026	ECOUDHATRM
89.69	trmA	& rrnB till pac,pga		1684	C	1684	326	0	JBac	173	1757	1991	ECTRMA	M57568	ECOTRMA
89.70	btuB	& birA,rts,tufB,sec,nus		2220	C	1	1511	0	JBac	161	904	1985	ECBTUB	M10112	ECOBTUB
89.73	rrnB	5'-flanking region corr		1821	C	7	578	0	BBA	739	173	1983	ECRRNB	V00347	ECORGNBP
89.78	rrsB rrlB	& rrfB corr		7258	C	275	7508	0	JMB	148	107	1981	ECRGNB	J01695	ECORGNB
89.86	birA	length BB		2491	C	894	2491	0	Gene	35	321	1985	ECBIRA	M10123	ECOBIRA
89.88	rts	-		1407	C	1132	157	0	Gene	74	555	1989	ECRTSA	M36321	ECORTSA
89.94	glyT			1973	C	1	1895	0	Gene	12	33	1980	ECTGTUFB	J01717	ECOTGTUFB
89.98	secE,nusG	-		1380	C	1	1380	0	JBac	172	1621	1990	ECSECE	M30610	ECOSECE
90.05	rpoBC	J01678 in Gb		3072	C	224	12337	0	PNAS	76	1697	1979	ECRPOBC	V00339	ECORPOBC
90.07	rpoC	-		5321	C	0	0	0	NAR	10	4035	1982	-	J01678	ECORPOBC
90.14	pac	penicillin acylase		2593	C	7	2593	0	NAR	14	5713	1986	ECPAC	X04114	ECOPACX
90.16	pga	83 bp diff p.acylase G		3158	C	2800	3158	0	Gene	56	87	1987	ECPGA	M17609	ECOPGA
90.30	hemE,HU-2	-		4184	T	1	3875	4443	Unpub.			1992	ECHEME	D12624	-
90.33	HU-2	= hupA		568	C	1	568	0	MGG	209	408	1987	ECHU2	X05994	ECOHU2
90.50	hydH	ATGA		1744	T	1	1380	24695	JBac	171	4448	1989	ECHYDHGA	M28369	ECOHYDHGA
90.53	purH	& metA,aceBAK,iclR,metH		3535	C	3535	1	0	JBCh	264	21239	1989	ECPURH01	J05126	ECOPURHD
90.55	rrnE ribos	operon E J01697 in Gb		410	C	59	372	0	Cell	17	201	1979	ECRNA7	V00335	ECORGNE
90.57	rrsE	16S RNA analog		1541	C	1519	3059	0	JMB	148	107	1981	ECRGNB	J01695	ECORGNB
90.58	gltV	= tRNA glu2 84.72?		354	C	1	354	0	JBac	170	1235	1988	ECTGGA	M20398	ECOTGGA
90.59	rrlE	23S RNA analog		2903	C	3500	6403	0	JMB	148	107	1981	ECRGNB	J01695	ECORGNB
90.60	rrfE/A	intergenic region		247	C	129	220	0	Cell	19	393	1980	ECRGNDS3	K00766	ECORGNDS3
90.61	rrsE	-		1444	C	1	1197	0	NAR	13	5515	1985	ECRRNE1	X02800	ECORRNE
90.63	metA	-		973	C	1	661	0	NAR	17	2856	1989	ECMETAG	X14501	ECOMETAG
90.66	aceB	publ. also NAR 16 10924		2280	C	1	2280	0	NAR	16	9342	1988	ECACEB	X12431	ECOACEB
90.67	aceA	-		1344	C	109	970	0	NAR	16	5689	1988	ECACEA	X07543	ECOACEA
90.68	aceAK	-		2358	C	56	2358	0	JBac	170	2763	1988	ECIDHKPA	M20714	ECOIDHKPA

Listing 1: (*continued*)

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90.71 iclR       intergenic reg. M36173              2509 C    2416   134      0 Gene  97    149 1991 ECINTER  M63497 ECOINTER
90.73 iclR       repressor                           1166 C    1166     1      0 JBac 172   2642 1990 ECICLR   M31761 ECOICLR
90.74 metH       100 bp deleted           C137.0     4098 C     276  4098      0 Gene  87     15 1990 ECMTHM   X16584 ECOMTHM
91.20 lysC       -                                   1587 T    1587     1   4154 JBCh 261   1052 1986 ECLYSCA3 M11812 ECOLYSC
91.22 pgi        -                                   2573 C       7  2573      0 MGG  217    126 1989 ECPGI    X15196 ECOPGI
91.46 xylE                           map             2842 T    2842     1  10805 JBCh 262  13928 1987 ECXYLE   J02812 ECOXYLE
91.51 malG       -                                   1103 C    1013     1      0 EMBO   4   2287 1985 ECMALG   X02871 ECOMALG
91.54 malEK      mut                      D036.0      144 C     169  6504      0 N    285     78 1980 ECMALB   J01648 ECOMALB
91.67 malM       corr                                1313 C     700  1313      0 JMB  191    303 1986 ECMALM   X04477 ECOMALM
91.75 ubiCA      -                                   2348 T       1   190   7968 FEBS 307    347 1992 ECUBI    X66619 ECOUBI
91.76 ubiA       -                                   2000 C       1  1038      0 JBac 174   5309 1992 ECUBICA  M93136 ECOUBICA
91.79 plsB       -                                   3865 C    3865     1      0 JBCh 258  10856 1983 ECPLSB   K00127 ECOPLSB
91.81 lexA       -                                    943 C       7   680      0 NAR    9   4149 1981 ECLEXA1  V00300 ECOLEXA
91.86 dinF       -                                   2201 C       1  2201      0 Unpub.          1992 ECLEXDIN L02362 ECOLEXDIN
91.90 qor, dnaB  qor = hcr                           2335 T    2325     1   3396 Unpub.          1992 ECDNABA  L02312 ECODNABA
91.91 dnaB       -                        B047.0     1661 C     591  1661      0 JBCh 259     97 1984 ECDNAB   K01174 ECODNAB
91.95 tyrB       -                                   1733 T       1  1733   1733 BBRC 133    134 1985 ECTYRBA  M12047 ECOTYRBA
92.10 uvrA       -                                   3205 T    3205   120   3850 JBCh 261   4895 1986 ECUVRAA  M13495 ECOUVRAA
92.14 ssb        -                        F018.8      764 C       1   764      0 PNAS  78   4274 1981 ECSSB    J01704 ECOSSB
92.20 soxS       2. determination                    1372 T       1  1372   1372 NAR   19   4479 1991 ECSOXSR  X59593 ECOSOXSR
92.60 fdhF       -                                   2273 T       1  2971   2971 PNAS  83   4650 1986 ECFDHF   M13563 ECOFDHF
92.61 fdhF       -                                    784 C       0     0      0 AcMB 148     44 1987 ECFDHF   M13563 ECOFDHF
92.70 proP       -                                   2138 T       1  2138   2138 Unpub.          1992 ECPROBETTM83089 -
93.00 lysU       -                                    566 T       1   563   2081 Unpub           1992 ECLYSU5F D11104 ECOLYSU5F
93.01 lysU       comp to lysS             D060.5     1518 C       1  1518      0 NAR   18    305 1990 ECLYSUG  X16542 ECOLYSUG
93.30 phnC,phnP  very similar to 93,31              11672 T       1 11672  11672 JBac 173   2665 1991 ECPHN    D90227 ECOPHN
93.31 phnA-Q     E.coli B  alkylphosph.             15611 C       0     0      0 JBCh 265   4461 1990 ECPHNAQ  J05260 ECOPHNAQ
93.33 psiD = phn -                                    203 T       1   203    203 JBac 172   3191 1990 ECALPHOH M33730 ECOALPHOH
93.34 psiD = phn -                                     52 T       1    52     52 JBac 172   3191 1990 ECALPHOF M33728 ECOALPHOF
93.40 adi        arginine decarboxylase              3004 T    3004     1   5750 MoMB   7   1221 1993 ECARGDECAM93362 ECOARGDECA
93.41 melRAB     -                                   1628 T     425  1628      0 Gene  59    253 1987 ECMELOPA M18425 ECOMELOPA
93.43 melA       -                                   1835 C     294  1835      0 NAR   15   2213 1987 ECMELA   X04894 ECOMELA
93.45 melB       -                                   1575 C     139  1575      0 JBCh 259   4320 1984 ECMELB   K01991 ECOMELB
93.50 fumB       map                                 3162 T       1  3162   3162 JBac 171   3494 1989 ECFUMB   M27058 ECOFUMB
93.70 lysU       -                        D060.5     3034 T       1  3034   3034 JBac 172   3237 1990 ECLYSU   M30630 ECOLYSU
93.85 pheR       comparison to pheW,U,V              1015 T       1  1015   1015 JBCh 265  21527 1990 ECPHER   J05693 ECOPHER
93.90 pheU       152 bp id. K00969 in Gb              312 T       1   312    312 NAR   11   4379 1983 ECTRNAP  X00912 ECOTRNAP
94.00 cadCBA     2D:cadA                  G075.0     4349 T    4349  1834   6625 JBac 174   2659 1992 ECCADABC M76411 ECOCADABC
94.01 cadCBA     -                                   5028 C    4109     1      0 JBac 174    530 1992 ECCADAB  M67452 ECOCADAB
94.11 aspA       -                                   2921 T       1  2921   3364 BJ   237    547 1986 ECASPAG  X04066 ECOASPAG
94.12 aspA       E.coli W                            2901 W    2459  2901      0 NAR   13   2063 1985 ECASPA   X02307 ECOASPAW
94.15 mopBA    = groESL          2D:mopB  C015.4     2267 T       1  2267   2267 N    333    330 1988 ECGROESL X07850 ECOGROESL
94.20 sugE       two overlapping frames               786 T       1   786    786 EMBO  12    889 1993 ECSUGEA  X69949 -
94.40 geneX      lysyl-tRNA synthetase 2             1151 T    1151     1   6116 Gene 108    163 1991 ECGENXLTRX59988 ECOGENXLTR
94.41 frdAB,ampC & frdCD                              240 C     518  5482      0 N    290    221 1981 ECAMPCFR J01611 ECOAMPCFR
94.70 psd        -                                   1350 T       1  1350   1350 JBCh 263  11516 1988 ECPSD    J03916 ECOPSD
94.75 glyV       tRNA Gly3                            423 T       1   423    423 JMB  212    579 1990 ECTRNAG3 X53236 ECOTRNAG3
94.85 miaA       also M37459;sim.to S.th             1328 T       1  1328   7712 JBac 173   1711 1991 ECMIAA   M63655 ECOMIAA
94.88 hfq,miaA   -                                   1290 C     739  1290      0 NAR   19   1063 1991 ECHFQ    D00743 ECOHFQ
94.89 hflX       F.Banuett/I.Herskowitz              4843 C       1  4343      0 Unpub.   K.Rudd 1991 -        ES3043 hflXeco
95.00 purA       -                                   2726 C       1  2726      0 JBCh 263  19147 1988 ECPURAA  J04199 ECOPURAA
95.50 rpsFR,rplI -                                   1979 T       1  1979   1979 MGG  204    126 1986 ECRPSFRI X04022 ECORPSFRI
95.70 cpdB       -                                   2198 T    2198     1   3579 JBac 165   1002 1986 ECCPDB   M13464 ECOCPDB
95.72 amtA       -                                   2121 C     742  2121      0 JGMi 137    983 1991 ECAMTA   M55170 ECOAMTA
95.95 fbp        -                        G038.6     1611 T       1  1611   1611 NAR   16   8707 1988 ECFBPASE X12545 ECOFBPASE
96.00 x96        -                                   1035 T       1  1035   1035 Unpub.          1992 ECX96A   M95096 ECOX96A
96.10 pmbA       -                                   1682 T       1  1682   1682 MoMB   4   1921 1990 ECPMBA   X54152 ECOPMBA
96.20 nrdD       ribonucl.trip.reductase             3887 T       1  3887   3887 PNAS  90    577 1993 ECNRDDA  L06097 ECONRDDA
96.50 pyrBI      -                                    758 T       0     0   2028 JBac 163    991 1985 ECPYRBIB M10743 ECOPYRBIB
96.53 pyrB       -                                    758 C       1  1581      0 PNAS  80    368 1983 ECPYRBI  J01670 ECOPYRBI
96.57 pyrBI      -                                   1410 C     964  1410      0 PNAS  81    115 1984 ECPYRBIA K01472 ECOPYRBIA
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96.60	argI	new BB	F039.0	300	T	1	300	1222	EMBO	1	853	1982	ECARGIPR	M24186	ECOARGIPRM
96.62	argI	-	F039.0	1085	C	164	1085	0	NAR	11	8509	1983	ECARGI	X00210	ECOARGI
96.70	valS	-	E106.0	3291	T	3293	2997	5326	NAR	15	9081	1987	ECVALS	X05891	ECOVALS
96.72	valS	-	E106.0	57	C	3011	180	0	JBCh	263	857	1988	ECSYNTGV	J03497	ECOSYNTGV
96.75	holC	correction		677	C	677	211	0	Unpub.			1992	ECHOLCG	Z14155	-
96.77	xerB	= pepA & urf13		1692	C	1730	1	0	EMBO	8	1623	1989	ECXERB	X15130	ECOXERB
96.95	leuX	-		1101	T	1	1100	1100	JMB	177	627	1984	ECTRNLSU	X04174	ECOTRNLSU
97.10	is4	flanking regions new BB		173	T	1	173	173	MGG	181	169	1981	IS4ECO	J01733	INS4ECO
97.20	fecEDCBARI	-		4842	T	4839	1	9818	JBac	171	2626	1989	ECFECBCDE	M26397	ECOFECBCDE
97.21	fecEDCBA	-		2645	C	2417	2	0	JBac	170	2716	1988	ECFEC	M20981	ECOFEC
97.22	fecARI	-		4074	C	2563	1	0	JBac	172	6749	1990	ECFECIR	M63115	ECOFECIR
97.80	fimB	-		1359	T	1	271	4159	Unpub.			1993	ECFIMBPR	L07756	-
97.81	fimBE	function		3050	C	2	3050	0	EMBO	5	1389	1986	ECFIMBE	X03923	ECOFIMBE
97.84	fimA	-		1450	C	612	1450	0	EJB	143	395	1984	ECFIMA01	X00981	ECOFIMA
98.05	fimD	P.Klemm		1058	T	1	1058	1058	Unpub.		K.Rudd	1991	-	ES3033	fimDeco
98.10	fimD	10kb map of fimBEACDFGH		2718	T	1	2718	4732	MGG	220	334	1990	ECFIMD	X51655	ECOFIMD
98.11	fimFGH			2050	C	37	2050	0	MGG	208	439	1987	ECFIMFGH	X05672	ECOFIMFGH
98.20	uxuA	-		434	T	1	434	434	MGG	202	112	1986	ECUXU1	X03411	ECOUXU1
98.30	mcrD	downstream of mcrB		1803	T	1	1803	1803	Unpub.			1992	ECMCRD	X55662	ECOMCRD
98.40	mcrBC	corr M34235 in paper		2576	T	0	0	11960	JBac	172	4888	1990	ECMCRBC	M58752	ECOMCRBC
98.43	mcrB	-		2695	C	2695	325	0	JBac	171	1974	1989	ECMCR	M24927	ECOMCR
98.44	hsdS	J01632 in Gb		2528	C	2528	231	0	JMB	166	1	1983	ECHSDK	V00288	ECOHSDK
98.45	hsdRMS	-		5591	C	5591	1	0	JMB	198	159	1987	ECHSDRM	X06545	ECOHSDRM
98.46	mrr,orf	& hsdR		2017	C	318	2017	0	JBac	173	5207	1991	ECMRR	X54198	ECOMRR
98.75	dnaTC	-		2554	T	1	2554	2554	JBCh	263	15083	1988	ECDNATC	J04030	ECODNATC
98.95	tsr	J01718 in Gb	B060.1	1788	T	1	1788	1788	N	301	623	1983	ECTSRX	V00373	ECOTSR
99.10	rimI	new BB		1423	T	1	1423	1423	MGG	209	481	1987	ECRIMI	X06117	ECORIMI
99.15	leuV	tRNA leu J01712 in Gb		699	T	1	699	699	NAR	9	2121	1981	ECTRNA	V00363	ECOTRNA
99.25	osmY	-		1182	T	1	1182	1182	JBac	174	3637	1992	ECPERPLAS	M89635	ECOPERPLAS
99.31	deoRCAB	-		480	T	1	480	2085	EMBO	5	2015	1986	ECDEOP1	X04151	ECODEOP1
99.33	deoCA	X00314 in Gb		204	C	114	1718	0	EMBO	3	179	1984	ECDEOCA1	X03224	ECODEOCA1
99.38	deoA	S.Short		1471	T	1	1471	1471	Unpub.		K.Rudd	1991	-	ES3017	deoAeco
99.40	deoAB	-		358	T	1	358	358	NAR	12	5211	1984	ECDEOAB	X00742	ECODEOAB
99.45	deoD	-		1249	T	1	1249	1249	PNAS	88	7185	1991	ECPNP	M60917	ECOPNP
99.50	serB	& smp,orf		1161	T	1161	1	2011	NAR	13	7025	1985	ECSERB	X03046	ECOSERB
99.51	smp,orf	M30784 in Gb		954	C	1162	2011	0	Gene	82	219	1989	--SMP	0010MK	ECOSERB
99.60	sms	cotranscribed with serB		1832	T	1	1832	1832	Unpub.			1991	ECSMSG	X63155	ECOSMSG
99.70	slt,trpR	-		2548	T	1	2093	3382	JBac	173	6773	1991	ECSLTY	M69185	ECOSLTY
99.74	trpR	identical BamHI site ?		1289	C	1	1289	0	Unpub.			1992	ECTRPR1	J01715	ECOTRPR
99.75	rob	binds replication origi		1946	T	1946	664	6745	JBCh	268	5365	1993	ECROB	M94042	ECOROBPHOM
99.76	phoM	operon & cet,dye		4658	C	1	4658	0	JBac	168	294	1986	ECPHOM	M13608	ECOPHOM
99.78	dye	-		1468	C	1	804	0	JBCh	260	4236	1985	ECDYE	M10044	ECODYE
99.85	orf 88,ile	-		890	T	1	890	890	JBCh	261	9966	1986	ECILER	M14018	ECOILER
101.01	abc	mdl ? glycoprotein rel.		793	T	1	793	793	Unpub.			1993	ECABC	L08626	-
101.02	apeA	protease I		919	T	1	919	919	Unpub.			1993	ECAPEA	D13180	-
101.03	antizyme	inhibitor ornit. decarb		6414	T	1	6414	6414	Unpub.			1993	ECANTZYM	L13078	-
102.01	bacA	bacitracin resistance		1641	T	1	1641	1641	Unpub.			1993	ECBACTRA	L12966	-
102.02	baeSR	-		2495	T	1	2495	2495	Unpub.			1993	ECBAESR	D14054	-
102.03	basRS	-		2736	T	1	2739	2736	Unpub.			1993	ECBASRS	D14055	-
103.01	chm	5-carboxymeth.2h-isomer		532	C	1	532	532	FEBS	266	63	1990	ECCHM	X53666	ECOCHM
103.02	cybC	cytochrome b562; X67289		612	B	1	612	612	Unpub.			1992	ECCYBC	X67290	-
104.01	DH1	7a-bile dehydrogenase		1884	F	1	1884	1884	JBac	173	2173	1991	-	-	-
104.02	dniR	hexaheme nitrate reduct		2596	T	1	2596	2596	FEMS	83	205	1991	ECDNIR	X60739	ECODNIR
105.01	ethidium	efflux gene		1244	T	1	1244	1244	FEMS	82	229	1991	ECETHRES	Z11877	ECOETHRES
105.02	evgS,evgA	-		3295	T	1	5159	5159	Unpub.			1993	ECEVGS	D14008	-
106.01	fadI	-		1021	T	1	1021	1021	Unpub.			1992	ECFADI	M85227	ECOFADI
106.02	ftsN	suppressor of ftsA		1416	T	1416	1416	1416	Unpub.			1993	ECFTSN	L14281	-
107.01	glgS	-		487	T	1	487	487	MoMB	6	0	1992	ECGLGSG	Z11885	ECOGLGSG
107.02	gltP	glutamate carrier prot.		1631	T	1	1630	1631	JBac	172	3214	1990	ECGACAR	M32488	ECOGACAR
108.01	hap2 ??	unknown name		1614	T	1	1614	1614	JBac	174	3377	1992	ECHPA2	M81963	ECOHPA2
108.02	holB	delta subunit DNA polym		1712	T	1	1712	1712	Unpub.			1992	ECDNAPDPS	L01483	ECODNAPDPS

Listing 1: (*continued*)

108.03	holE	theta subunit DNA polym		507	T	1	8	649	Unpub.			1992	ECDNAPOLY	L04572	ECODNAPOLY
108.04	holE	theta subunit DNA polym		641	C	1	641	0	Unpub.			1992	ECHOLETTA	L05381	ECOHOLETTA
113.01	MBP16-1	maltose binding protein		87	T	1	87	87	JBac	171	4640	1989	ECMPB161	M29860	ECOMPBATA
113.02	mdl	related to P-glycoprote		3690	T	1	3690	3690	Unpub.			1993	ECMDL	L08627	-
113.03	methionine	synthase, cobalamin dep		2847	T	1	2847	2847	BiCh	31	6045	1992	ECCDMS	M87625	ECOCDMS
113.04	metX	S-adenosinemeth.synthet		1152	T	1	1152	1152	Unpub.			1992	ECMETX	M98266	ECOMETX
113.05	mlt	-		1743	T	1	1743	1743	JBac	174	6394	1992	ECMLT	M87660	ECOMLT
113.06	msr,msd	reverse transcriptase ?		1330	A	1	1300	1330	MoMB	0	0	1991	ECRNEC107	X62583	ECORNEC107
113.07	mukB	chromosome partitioning		5353	T	1	5353	5353	Unpub.			1991	ECMUKB	M63930	ECOMUKB
113.08	murA	phosphoenolpyruvate tr.		2147	T	1	2147	2147	Unpub.			1992	ECMURA	M96355	ECOMURA
113.09	peptide	meth.sulfoxide reductas		1270	T	1	1270	1270	JBCh	267	15549	1992	ECPMSR	M89992	ECOPMSR
114.01	narQ	-		1710	T	1	9	1728	Unpub.			1992	ECNARQ	X65714	ECONARQ
114.02	narQ	-		1719	C	1	1729	0	Unpub.			1992	ECNARQB	M94724	ECONARQB
114.03	neuA	E.coli K1		1283	T	1	1283	2805	JBCh	264	14769	1989	ECNEUA	J05023	ECONEUA
114.03	neuC	E.coli K1		1676	C	155	1676	0	JBac	174	315	1992	ECNEUC	M84026	ECONEUC
116.01	promoter	strong promoter search		201	T	1	201	201	JJGe	66	399	1991	ECDPR	D01031	ECODPR
116.02	ppx	exopolyphophatase		1884	T	1	1884	1884	Unpub.			1992	ECPPX	L06129	ECOPPX
116.03	appII,pepP	aminopeptidase P		1850	T	1	1850	1850	JBlo	105	412	1989	ECAPP2	D00398	ECOAPP2
116.04	ppfA	phosphatase folding		2192	T	1	2192	2192	EMBO	11	57	1992	ECPPFA	X63186	ECOPPFA
116.05	ppa	pyrophosphatase	F084.0	1195	T	1	1195	1195	JBac	170	5901	1988	M23550	M23550	M23550
116.06	psiK	-		86	T	1	86	86	JBac	172	3191	1990	ECALPHOP	M33738	ECOALPHOP
116.07	psiR	-		37	T	1	37	37	JBac	172	3191	1990	ECALPHOL	M33734	ECOALPHOL
116.08	psiJ	-		57	T	1	57	57	JBac	172	3191	1990	ECALPHOS	M33741	ECOALPHOS
116.09	psiJ	-		29	T	1	29	29	JBac	172	3191	1990	ECALPHOW	M33745	ECOALPHOW
116.10	heat shock	promoter 10,92 BB ?		96	T	1	96	96	PNAS	82	2679	1985	ECC625	M10419	ECOC625
116.11	ptrII	protease II		2339	T	1	2339	2339	JB	110	315	1991	ECPT2	D10976	ECOPT2
118.01	rarB,rhlE	regulation DNA replicat		8355	T	1	8355	8355	Unpub.			1993	ECRHLEA	L02123	-
118.02	regX			256	T	1	256	256	Unpub.			1992	ECREGX	X66589	ECOREGX
118.03	response	to heterologous protein		2885	T	1	2885	2885	Unpub.			1992	ECPROTS	M94104	ECOPROTS
118.04	rpsV S22	-		2260	T	1	2260	2260	Unpub.			1992	ECRPSV	D13179	ECO22RPSV
119.01	sdaA	-		2605	T	1	2605	2605	JBac	171	5095	1989	ECSDAA	M28695	ECOSDAA
119.02	sdaB	-		2785	T	1	2785	2785	Unpub.			1992	ECSDAB	L07763	-
119.03	srmB	-		1967	T	1	1973	1973	N	336	496	1988	ECSRMB	X14152	ECOSRMB
119.04	sseAB	enhance of serine sense		2804	T	1	2804	2804	Unpub.			1993	ECSSEAB	D10496	-
119.05	slyDX	phage infect cell lysis		977	T	1	977	977	Unpub.			1993	ECSLYDX	L13261	-
120.01	tesA	thioesterase I		1168	T	1	1168	1168	Unpub.			1993	ECTESA	L06182	-
121.01	uspA	universal stress protei		1	T	1	1133	1133	Unpub.			1992	ECUSPA	X67639	ECOUSPA
124.01	xylose	gene for xylose-uptake		363	T	1	363	363	NAR	14	7115	1986	ECXYLUP1	X04387	ECOXYLUP1
200.01	is1	6 commun copies		768	I	1	768	4608	MGG	169	213	1979	IS1ECLAC	J01729	INS1ECLAC
200.02	is2	7 copies M18426 in Gb		1331	I	1	1331	9317	Gene	59	291	1987	ECGALI	V00279	ECOINS2K
200.03	is3	6 commun copies		1258	I	1	1258	6290	NAR	13	2127	1985	ECIS3	X02311	INS3
200.04	is4	1 commun copy		1426	I	1	1426	1426	MGG	181	169	1981	IS4ECO	J01733	INS4ECO
200.05	is5	length MK		1195	I	1	1195	11950	N	297	159	1982	IS5LAM	J01735	INS5LAM
200.10	is10	IS10-R		160	I	1	160	160	JBac	164	556	1985	ECOOUT2	K03315	ECOTRNOU2
200.10	is10	IS10-L		160	I	1	160	160	JBac	164	556	1985	ECOOUT1	M11410	ECOTRNOU1
200.30	is30	3 commun copies		1221	I	1	1221	3663	EMBO	3	2145	1984	ECIS30	X00792	INS30ECO
200.91	IS91	-		1829	T	1	1829	1829	JBac	174	1345	1992	ECIS91TP	X17114	ECOIS91TP
201.50	is150	1 commun copy		1443	I	1	1443	1443	NAR	16	6789	1988	ECIS150	X07037	INS150CG
201.86	is186	4 copies length MK		1336	I	1	1341	2672	FEBS	192	47	1985	IS186	X03123	INS186ECB
304.03	tRNA asp &	trp		241	T	1	382	382	NAR	10	7153	1982	ECTGDW	K01858	SYNTGDWS
313.04	leu tRNA1	-		146	T	1	146	146	Cell	30	855	1982	ECTGLGKP	K01687	SYNTGLGKP
313.06	leu tRNA3	CTC single gene		300	T	1	300	300	Gene	81	193	1989	ECTGL3A	M29082	ECOTGL3A
316.04	pheW	-		492	T	1	492	492	NAR	14	5937	1986	ECPHEW	X04126	ECOPHEW
401.00	6S RNA	-		184	T	1	184	184	NNB	229	147	1971	ECRRN6S	X01238	ECORRN6S
402.00	spot 42RNA	-		109	T	1	109	109	JMB	131	573	1979	EC42RNA	X01895	ECO42RNA

Listing 2: Partial main list sorted on genetic names

name	min.
aas	61.16
aat	19.15
aat*	54.50
abc	101.00
abpS	60.40
abs	94.65
accA	4.49
accD	50.02
acd	62.40
aceBAK	90.65
aceEF	2.95
aceK	90.70
ackA	49.50
ackB	38.90
acn	28.34
acpP	24.41
acpS	43.15
acrA	10.60
acrC	4.60
act	20.12
ada	47.60
add	35.83
adhE	27.42
adhR	71.45
adi	93.40
adk	10.89
ads	11.90
agp	22.60
aidBC	95.30
air	92.80
alaS	58.01
alaUV	87.31
alaV*	5.15
alaW	52.03
ald	32.10
ALDH	29.50
alkA	44.80
alkB	47.63
alr	91.92
als	93.02
alsB	19.40
alu	79.02
alx	67.50
amiA	51.50
amn	43.10
ampC	94.41
ampDE	2.90
ams	24.13
amtA	95.72
amyA	42.64
ana	27.28
anr	37.94
ansA	38.80
ansB	63.80
ant	0.46
antizyme	101.00
apaGH	1.10
apeA	101.00
aphCF	14.20
appACB	22.50
appII	116.03
appR	59.05
appY = M5	12.81
apt	10.82
araABCD	1.49
araE	61.38
araFGH	41.80
araJ	9.00
arcA	99.80
arcB	69.71
argA	60.60
argBCEH	89.34
argD	74.00
argF	6.51
argG	68.98
argI	96.62
argM	88.70
argP	63.30
argR	70.70
argS	41.30
argT	49.90
argU	12.34
argV	57.90
argX	85.70
aroA	20.24
aroB	74.37
aroC	50.42
aroDH	37.00
aroE	72.00
aroF	56.63
aroG	16.85
aroI	83.90
aroK	74.38
aroLM	8.90
aroP	2.71
aroT	27.53
artIQMJ	19.30
artP	18.95
ascG	58.60
asd	75.64
aslAB	85.92
asnAC	84.42
asnB	15.15
asnS	20.74
asnT	43.20
asnUV	43.40
aspA	94.12
aspC	20.66
aspS	41.14
aspT	84.75
aspU	5.18
aspV	5.20
aspV*	43.30
asu	33.20
atoCDAB	47.95
atp	59.21
atpBX	84.18
att e14R	25.20
att phi80	27.56
att186	57.10
att253	6.10
attb lam	17.44
attHK139	43.65
attHK22	22.40
attP1,P7	66.70
attP2 II	87.60
attP2 III	32.20
attp22	5.86
attP2H	43.60
attP4	97.05
attPA-2	51.00
avtA	80.31
azaA	43.55
azaB	69.85
azl	55.30
bacA	102.00
baeSR	102.00
baiF	0.76
barA	59.84
basRS	102.00
bax	80.30
bcp	53.23
betABI	7.53
betT	7.50
betT*	0.80
bfm	85.55
bfr	72.95
bglBCRST	84.01
bglY	27.36
bioABFCD	17.45
bioH	75.02
bioP	86.45
biotin	17.47
birA	89.86
bisC	79.30
bolA	9.91
brnQR	8.40
brnS	1.40
brnT	62.15
btuB	89.70
btuCDE	37.45
btuR	28.20
bymA	92.90
cadABC	94.00
cadR	46.55
caiABCDET	0.78
calA	95.20
calC	15.50
calD	9.35
can	63.35
capR	9.96
carAB	0.64
cbt	16.25
cca	66.81
cdd	46.10
cdh	88.28
cds	4.35
cdsS	69.25
celABCDEF	37.92
cet	99.77
cfa	36.65
cheABRWYZ	41.51
chlAM	17.71
chlB	86.80
chlC (nar)	26.94
chlDJ	17.30
chlEN	18.20
chlG	0.45
chm	103.00
cir	46.40
citA	17.60
clpA	19.11
clpB	56.36
clpPX	9.93
cls	26.85
cmlA ?	19.50
cmtAB	63.57
coaA	89.89
codAB	7.60
colicin A	46.50
corA	86.00
corB	96.30
cpdB	95.70
cpsABCDE	44.50
cpsF	90.20
cpxA	88.21
cpxB	40.30
crg	28.65
crl	5.81
crp	73.54
crp*	64.12
crr	52.23
cscB	51.10
csgA	23.15
csi	59.00
cspA	78.80
cstA	13.61
cup	97.60
cutE	14.70
cvpA	50.10
cxm	6.40
cyaAF	85.81
cybA	16.31
cybB	31.00
cybC	103.00
cycA	95.60
cydAB	16.60
cydCD	18.90
cynRSTX	7.85
cyoABCDE	9.80
cyr	91.77
cysB	28.32
cysCHIJK*NP	59.31
cysEX	80.81
cysG	74.22
cysQ	95.73
cysS	12.23
cysT*	42.31
cysAKMTW	52.31
cytR	88.80
dacA	14.43
dacB	69.11
dacC	18.60
dadAX	26.00
dadB	1.77
dadQ	98.65
dadR	26.05
dam	74.30
dapAE	53.01
dapB	0.62
dapCD	4.25
dapF	85.85
dapX	53.20
dbpA	29.90
dcd	45.60
dcm	42.90
dcp	30.95
dctA	79.40
ddl	2.16
ddlA	8.60
deaD	68.82
dedA	1.60
dedB	50.03
dedF	49.90
degP	3.86
del	61.50
deoABCDR	99.40
dfp	81.80
dga	89.72
dgd	69.75
dgkA	91.80
dgkR	93.75
dgoADKRT	83.00
dgsA	35.20
dgt	3.81
DH1	104.00
dicB*	90.18
dicBACF	34.90
dinA	1.47
dinF	91.86
dinG	17.80
dinH	19.42
divE	22.31
djp	55.50
dksA	3.54
dld	46.20
dmsABC	20.01
dnaAN	83.48
dnaB	91.90
dnaE	4.48
dnaG	66.94
dnaI	39.50
dnaJK	0.27
dnaL	28.70
dnaQ	5.34
dnaTC	98.76
dnaX	10.80
dnaY	12.30
dnaZX	10.83
dniR	104.00
dpj	55.51
dpp	13.90
dppA	79.01
dps	18.00
drdX	27.37
drpA	4.80
dsbA	87.40
dsbB	26.20
dsdAC	50.90
dsf	87.40
dtu	74.00
dut	81.90
dvl	7.40
dye	99.78
ebgRABC	67.80
ecfA	64.80
ecfB	87.98
eci	49.40
ecos1	34.60
ecos2	12.75
eda	40.80
edd	40.80
efg	38.10
endA	63.70
endB	19.60
eno	59.60
entABCD	13.59
envA	2.02
envB	70.90
envCD	73.80
envM	28.90
envN	3.95
envP	90.40
envQ	57.80
envT	14.10
envY	12.90
envZ	74.83
era	55.52
esp	17.40
ethidium	105.00
evgAS	105.00
exbBD	65.00
exbC	58.95
excC	16.73

Listing 2: (*continued*)

expA	22.20
exuTR	68.00
fabA	21.67
fabB	50.20
fabDG*	24.40
fabEG	71.14
fabH	24.17
fadAB	87.20
fadD	39.90
fadE	4.95
fadI	106.00
fadL	50.60
fadR	25.90
fam	75.96
fatA	69.15
fba	63.41
fbp	95.95
fcsA	87.00
fda	63.41
fdhDE	88.15
fdhF	92.60
fdnGHI	33.40
fdv	58.86
fdx	56.45
fecEDCBARI	97.20
feeB	15.14
feo	38.70
fepABCDEG	13.43
fes	13.45
fexB	86.50
ffs	10.20
fhlA	58.84
fhuABCD	3.61
fhuE	24.72
fhuF	98.90
fic	74.04
fimABECDFGH	97.82
firA	4.42
fis	71.60
fiu	17.90
fixABCX	0.84
flaA (I,II)	42.74
flaGHI	41.35
flbB	41.57
flbC	42.60
fldA	15.41
flgABCDEFG	23.90
flgHIJKL	23.91
flhABCD	41.40
fliADSTEFGH	42.50
fliIJKLM	42.72
fliNOPQR	42.80
flpB	85.95
flpC	72.30
flrD	87.12
flu	43.50
fms	72.10
fmt	72.10
fnr	29.80
folA	0.98
folC	49.97
folD	11.90
folE	45.00
folK	3.50
folP	69.01
fpg	81.29
fpp	79.00
fpr	88.44
frdABCD	94.44
frdR	26.50
fre	87.10
frr	4.21
fruABFK	46.80
fruR	1.97
fts36	2.00
ftsAILMQWZ	2.02
ftsESYX	75.97
ftsJH	69.30
ftsN	106.00
fucOAPIKR	60.30
fumB	93.50
fumCA	35.66
fur	15.40
fusA	73.07
fusB	14.90
g20.3	23.60
g30k	24.15
gadA	77.60
gadB	33.70
gadSR	81.60
galETK	17.01
galP	63.85
galR	61.35
galS	46.33
galU	27.30
gapB	63.44
gapDH	39.35
garA	15.55
garB	3.40
gatCAD	45.50
gcd	3.10
gcl	11.60
gcpE	54.12
gcvHT	62.60
gdhA	38.44
gef	0.31
gen-165	42.00
geneX	2.33
genF	93.51
ggt	75.80
gidAB	84.30
glc*	52.25
glc	64.60
glgABCDPSXY	75.54
glgS*	107.00
glk	51.80
glmS	84.11
glnALG	87.70
glnB (PII)	54.94
glnD	4.12
glnHPQ	18.01
glnR	23.80
glnSTUV	15.21
glpABCTQ	48.70
glpKFX	88.40
glpRGED	75.50
gltA	16.30
gltBDEF	70.01
gltE	80.75
gltH	21.35
gltM	42.45
gltN	76.70
gltP	107.00
gltR	92.30
gltSTU	84.71
gltV	90.58
gltW	56.25
gltX	52.04
glyAX	54.91
glyS	79.51
glyT	89.94
glyU	62.01
glyV	94.75
glyW	42.30
gnd	44.41
gntR	75.70
gntS	95.40
gntT	75.10
gntV	96.90
gor	77.20
gp24'	72.95
gppA	85.12
gppB	85.92
gprAB	0.20
gpsA	80.95
gpt	5.76
greA	69.10
groELS	94.16
groNB	10.41
grpD	71.50
grpE	57.00
grx	18.50
GSA	3.65
gshA	57.75
gshI	58.40
gshII	63.75
gsk	13.10
guaAB	53.91
guaC	2.70
gurB	73.70
gurC	17.85
gurD	68.05
gutABDQ	58.50
gyrA	48.21
H-NS	27.32
hag(48)	42.60
hap2 ??	108.00
hdhA	35.80
hel	85.10
helD	22.00
hemAM	26.65
hemB	8.21
hemCDXY	85.75
hemE	90.30
hemF	17.25
hemG	86.90
hemH	11.10
herC	62.20
het	84.44
hevABCDEFG	58.80
hevOP	58.81
hflB	69.20
hflCKX	94.93
hfq	94.88
hga	40.81
himAB	37.46
himD	20.43
hip	33.90
hip (himD)	20.43
hisABCDEGHI	43.91
hisJMPT	49.75
hisS	54.11
hisW	48.24
hlpA	4.40
hmp	54.90
hnr	27.26
hns	27.33
holA	14.60
holBE	108.00
holC	96.74
holD	99.11
hpt	3.25
hsdRMS	98.45
htgA	0.22
htpG	10.88
htpR	75.93
htpX	40.40
htrA	3.83
htrB	23.41
htrC	90.12
htrD	19.21
htrM	81.22
htrP	66.65
HU-1	10.01
HU-2	90.30
hupAB*	90.31
hupB (lon)	9.99
hyaABCDEF	22.10
hyc	58.88
hydCD	77.30
hydGH	90.51
hydL	64.70
hyp	58.88
hypABCDEFN	58.61
iap	59.20
ibpAB	83.25
icd	25.41
iciA	62.80
iclR	90.73
ict	80.70
ihb	19.46
ileR	99.90
ileS	0.55
ileV	5.15
ilvACDEGMY	84.84
ilvHI	1.87
ilvBN	82.63
ilvF	54.30
ilvJ	1.42
ilvR	99.95
ilvU	7.10
inaA	48.54
infA	19.12
infB	68.87
infC	37.50
inm	78.50
intX	58.24
ior	45.30
ispA	9.50
katC	6.70
katE	37.90
katG	89.07
kba	69.80
kbl	81.11
kch	27.55
kdgK	78.00
kdgR	40.20
kdgT	87.96
kdpABCDE	15.61
kdsA	26.70
kdsB	84.66
kdtA	81.27
kefB	73.40
kefC	0.96
kgtP	56.20
kpsDMT	64.31
ksgA	1.12
ksgB	36.75
ksgC	12.10
ksgD	30.70
kpsS	64.37
lacAIOPYZ	7.89
lamB	91.63
lepA(B)	55.60
leuABCDOP	1.80
leuJ	13.70
leuR	78.20
leuS	14.63
leuT	85.72
leuU	69.00
leuVX	99.15
leuW	15.11
leuX*	15.14
leuY	9.70
leuZ	42.30
lev	8.95
lexA	91.82
lig	52.11
linB	29.25
lipAB	14.40
lit	25.50
livHJK	75.85
livR	19.90
lon	9.97
lpcA	5.60
lpcB	65.50
lpd	27.55
lpd*	2.97
lpp	36.80
lpxAB	4.45
lrp	19.40
lrs	2.65
lsp(A)	0.57
luxH	66.64
lysAR	61.37
lysC	91.20
lysP	46.20
lysS	62.22
lysT	16.50
lysU	93.01
lysV	52.02
lysX	60.45
lytA	57.85
M5 protein	12.80
mac	10.10
mafB	1.90
malA	0.93
malBEFGKM	91.49
malIXY	35.81
malPQT	75.21
malS	80.30
malZ	9.10
manA	35.67
manC	87.90
manYZ	40.12
map	4.15
marAR	33.60
mazG	59.81
MBP16-1	113.00
mcrA	25.81
mcrBCD	98.30
mdh	70.71
mdl	113.00
mdoA	23.05
mdoB	99.00
mdrA	19.15
melABR	93.41
menA	88.60

gabTPD	57.60
mepA	50.40
met	84.82
metA	90.62
metBFJL	89.00
metC	65.01
metD	4.70
metEH*R	86.30
metG	45.92
metH	90.74
metK	63.62
metT	15.10
metX	113.00
metYZ	68.97
metZ*	60.20
mfd	25.30
mglABCD	46.31
mgt	92.50
miaA	94.85
micA	63.90
micF	47.82
minBCDE	26.10
mioC	84.39
mlt	113.00
mmrA	85.14
mng	38.95
moaABCDE	17.70
modABCD	17.32
molA	91.66
molR	65.30
momR	89.63
mopA*	24.00
mopBA	94.15
mor	89.60
motAB	41.55
motD	42.76
mprA	57.40
mraABRY	1.98
mrbABC	90.22
mrcA	74.60
mrcB	3.60
mrdAB	14.47
mreBCD	71.00
mrp	45.90
mrr	98.46
msbA	20.50
msbB	40.96
msgB	53.01
msd	113.00
msr	113.00
msyA	27.31
msyB	23.10
mtlACD	80.62
mtlOP	80.60
mtr	68.80
mukA	66.10
mukB	20.60
mul	82.80
mureine	12.65
murA	113.00
murB	89.85
murCDEFG	2.05
murH	99.05
murZ	69.45
mutD	5.30
mutH	61.05
mutL	94.86
mutM	81.70
mutS	58.87
mutT	2.31
mutY	63.91
mvrA	88.43
mvrB	28.45
mvrC	12.37
NAD(P)H	0.95
nadA	16.80
nadB	55.81
nadC	2.80
nagABCDE	15.18
nalB	57.70
nalD	89.15
nanA	70.30
narGHJIKLRX	27.02
narQ	114.00
narZYWV	33.10
ndh	24.80
ndk	54.20
neaB	73.90
nek	72.35
rhsA	80.52
gyrB	83.43
neuAC	114.00
neuES	64.37
nfnA	80.20
nfnB	13.20
nfo	46.60
nfsA	21.40
nfsB	11.40
nhaAR	0.47
nhaB	25.91
nirBDEC	74.20
nirR	29.80
nlp	69.50
nlpA	82.50
nlpB	53.21
nmpC	12.61
non	44.60
npl	70.31
nrdAB	48.51
nrdB*	88.04
nrdD	96.20
nth	36.40
ntr-like	37.95
ntrA	69.60
ntrC	87.81
nuo	49.20
nupC	51.60
nupG	64.11
nur	59.08
nusA	68.94
nusB	10.40
nusG	89.98
nuvA	9.30
nuvC	43.05
ogr	87.62
ogt	29.82
ompA	21.75
ompBCR	47.80
ompF	20.65
ompH	4.40
ompR*	74.82
ompT	12.83
oppABCD	27.51
oppE	98.60
oppI	19.46
opr	18.70
ops	63.50
optA	3.85
oriC	84.38
oriJ	30.40
osmB	28.83
osmC	32.40
osmY	99.25
osmZ	27.34
otsBA	41.60
oxyR	89.61
pabA	74.01
pabB	39.80
pabC	25.00
pac	90.13
pal	16.72
panBCD	3.30
panF	71.12
papABDEHFG	84.16
parC	66.41
parE	66.50
pbpA	14.48
pbpB	2.04
pckA	74.81
pcm	59.10
pcnB	3.51
pcsA	81.75
pdxA	1.13
pdxB	50.01
pdxH	36.01
pdxJ	55.50
pel	40.14
pep2	63.00
pepD	5.73
pepN	20.77
pepP	116.00
pepQ	87.23
pfa	49.65
pfkA	88.26
pfkB	37.71
pfl	20.10
pfrA	26.64
pfs	3.80
pga	90.16
rpsI S9	70.50
katF	59.01
pgi	91.22
pgk	63.40
pgl	17.35
pgm	15.05
pgpA	9.55
pgpB	28.50
pgsA	42.33
pheA	56.61
pheP	13.00
pheRU	93.86
pheST	37.48
pheV	64.00
pheW	316.00
phnA-Q	93.31
phoA	8.70
phoBR	9.05
phoE	5.82
phoH	23.70
phoM	99.76
phoPQ	25.60
phoSTU	84.04
phr	15.70
phrA	17.20
phxB	16.90
pilA	97.85
pinl	25.70
pit	76.50
pldAB	86.16
plsB	91.79
plsC	66.40
plsX	24.17
pmbA	96.10
pmi	15.05
pncA	38.75
pncB	20.76
pnp	68.83
pntAB	35.41
poaR	63.10
pog	70.10
polA	87.50
polB	1.45
polC	4.48
popC	3.65
popD	0.15
potABCD	15.00
potE	15.60
potFHGI	19.00
poxA	94.60
poxB	18.81
ppa	116.00
ppc	89.22
ppfA	116.00
ppiA	74.05
ppiB	12.20
ppk	53.73
ppsA	37.11
ppx	116.00
prc	40.41
prfA (RF1)	26.68
prfB (RF2)	62.24
priA	88.82
priB	95.51
priC	10.70
prlA	72.49
prlB	84.64
prlC	70.80
prlD	2.60
prlF	68.41
prmA	71.40
prmB	50.50
proAB	5.83
proC	8.86
proK	79.21
proL	46.00
proM	85.73
proP	92.70
proS	4.80
proT	83.60
protein E	21.66
proU(VWX)	58.30
prp	97.50
prrBCD	29.30
prs	26.60
psd	94.70
psi51	48.73
psiC	75.84
psiD	93.32
psiE	91.48
srmB	119.00
menBCDE	48.95
psiF	8.82
psiH	23.72
psiJKR	116.00
psiQ	70.02
pspABCDE	29.10
pss	56.21
pssR	84.62
pstBAC	84.07
psu	1.65
pth	26.40
ptr	60.65
ptrII	116.00
ptsF	45.80
ptsG	24.70
ptsHI	52.24
ptsMPL	40.10
pufXY	48.20
purA	95.00
purB	25.62
purC	53.20
purDH	90.54
purEK	12.00
purF	49.91
purL	55.20
purMN	53.71
purP	83.84
purR	36.61
pus	19.80
putACP	22.80
pykA	40.85
pykF	36.70
pyrBI	96.50
pyrC	23.50
pyrD	21.20
pyrE	81.92
pyrF	28.81
pyrG	59.80
pyrH	4.65
pyrS	80.90
qmeA	28.95
qmeC	74.10
qmeD	61.60
qmeE	36.90
qor	91.90
queA	9.12
racC	30.21
radA	99.55
radC	81.33
ranA	55.82
rap	26.40
rarB	118.00
rarD	86.01
ras	9.75
rbaB	55.80
rbsABCDKR	84.52
rcsA	43.00
rcsCB	48.10
rcsF	4.90
rdgA	16.15
rdgB	64.20
recAN	58.10
recBD	60.63
recC	60.66
recE	30.20
recF	83.45
recG	82.15
recJ	62.25
recO	55.54
recQ	86.15
recR	10.87
regX	118.00
relA	59.82
relBEF	34.70
relX	59.90
rep	85.11
rer	89.55
rfaBCDFGIJ	81.20
rfaH	86.70
rfaLKPQYZ	81.20
rfbABCMK	44.40
rfe	85.45
rffDE	85.50
rfs	42.61
rglB	98.42
rhaABCDRST	88.00
rhlB	85.13
rhlE	118.00
rho	85.19
trkG	30.50

Listing 2: (*continued*)

rhsB		77.41
rhsC		15.67
rhsD		11.51
rhsE		31.90
ribA		28.34
ribB		66.00
ribC		40.00
ridA		71.30
ridB		85.30
rimB		37.80
rimC		26.75
rimD		87.93
rimE		72.25
rimFG		0.70
rimH		13.80
rimI		99.10
rimJ		23.61
rimK		19.05
rimL		32.60
rit		89.10
rlpAB		14.45
rmf		21.65
rna		14.30
RNA	7 S	71.82
RNAse	10Sb	68.23
rnb		28.75
rnc		55.56
rnd		39.60
rne		24.11
rnhA		5.35
rnhB		4.47
rnpA		83.55
rnpB		68.19
rnsA		14.30
rnt		36.11
rob		99.75
rod		44.20
rodA		14.46
rph		81.96
rpiA		63.25
rplA	L1	90.00
rplB	L2	72.71
rplC	L3	72.74
rplD	L4	72.73
rplE	L5	72.62
rplF	L6	72.59
rplI	L9	95.50
rplJ	L10	90.01
rplK	L11	89.99
rplL	L12	90.02
rplM	L13	70.50
rplN	L14	72.64
rplO	L15	72.51
rplP	L16	72.67
rplQ	L17	72.40
rplR	L18	72.58
rplS	L19	56.80
rplU	L21	69.40
rplV	L22	72.69
rplW	L23	72.72
rplX	L24	72.63
rplY	L25	47.70
rpmA	L27	69.41
rpmB	L28	81.31
rpmC	L29	72.66
rpmD	L30	72.56
rpmE	L31	89.08
rpmF	L32	24.16
rpmG	L33	81.32
rpmH	L34	83.54
rpmI	A	37.52
rpmJ	X	72.48
rpoA		72.41
rpoBC		90.04
rpoD		66.96
rpoH		75.98
rpoN		69.60
rpoS		59.00
rpoZ		82.12
rpsA	S1	20.40
rpsB	S2	4.16
rpsC	S3	72.68
rpsD	S4	72.44
rpsE	S5	72.57
rpsF	S6	95.50
rpsG	S7	73.08
rpsH	S8	72.60
rpsJ	S10	72.75
rpsK	S11	72.45
rpsL	S12	73.12
rpsM	S13	72.46
rpsN	S14	72.61
rpsO	S15	68.85
rpsQ	S17	72.65
rpsR	S18	95.50
rpsS	S19	72.70
rpsT	S20	0.52
rpsU	S21	66.93
rpsV	S22	118.00
RRF		4.21
rrnA		87.26
rrnB		89.73
rrnC		84.69
rrnD		71.92
rrnE		90.56
rrnG		56.36
rrnH		5.11
rsl		56.34
rts		89.88
ruvABC		41.10
sad		34.30
sbaA		96.40
sbcB		43.70
sbcC		9.03
sbm		62.80
sbmA		8.50
sbp		88.27
sdaAB		119.00
sdhAB		16.36
sec63		1.20
secA		2.30
secB		81.00
secC		68.50
secDF		9.15
secE		89.98
secY		72.50
sefA		4.30
seg		0.29
selABC		80.40
selD		38.55
semA		39.70
serA		62.82
serB		99.50
serC		20.24
serR		1.94
serS		20.00
serT		22.30
serU		43.24
serV		57.90
serW		19.12
serX		23.20
sfaA	EC536	119.00
sfcA		33.50
sfiB		2.28
sfiC		26.35
sfrB		86.70
sfrC		7.00
sfsl		3.55
sfuABC		1.70
shiA		43.35
shl		1.88
sipCD		82.45
sKp		4.44
sloB		73.60
slt		99.71
slyDX		119.00
smbA		4.18
smp		99.51
smpAB		58.22
sms		99.60
sodA		88.03
sodB		36.50
sohA		68.40
sohB		28.30
soxQ		33.80
soxRS		92.23
speABC		63.61
speDE		3.01
speF		15.60
spf		87.52
spoRTU		82.10
spoV		14.46
sppA		38.59
srlDMRQ		58.53
srnA		9.45
ssaD		9.25
ssaE		50.30
ssaG		41.20
ssaH		94.55
ssb		92.15
sseAB		119.00
sspAB		70.15
ssr		62.90
ssrA		58.25
ssyA		54.40
ssyB		9.40
ssyD		3.20
stpA		57.95
strM		76.20
stsA		83.88
sucABCD		16.39
sufI		66.40
sugE		94.20
suhA		76.90
suhB		54.60
sulA		21.71
sulB		2.28
supD		43.22
supQ		12.70
surA		1.14
tabC		86.05
tag		79.31
tap		41.49
tar		41.50
tau		35.61
tcp		23.35
tdcABCR		68.12
tdh		81.10
tdi		4.00
tdk		27.38
terC1		28.82
terC2		35.60
terC3		34.40
terC4		27.06
terE		23.00
terF		48.12
tesA		120.00
tesB		10.30
tet1		0.12
tet2		0.89
tgt		9.13
thdA		10.55
thdC		94.80
thdD		99.65
thdF		83.70
thiABC		90.44
thiD		45.20
thiK		24.90
thiL		9.60
thrABC		0.03
thrS		37.57
thrTU		89.95
thrV		71.83
thrW		5.85
thyA		60.67
tig		9.92
tkt		63.56
tlnA		10.50
tls		41.15
tmk		24.60
tnaABC		83.74
tnm		92.00
toc		66.85
tolABQR		16.71
tolC		66.61
tolDE		22.90
tolIJ		0.11
tolM		72.20
tolZ		77.70
tonA		27.59
tonB		27.57
topA		28.30
topB		38.55
torA		28.10
tpi		88.29
tpr		27.15
treA		26.30
trg		31.10
trkA		72.15
trkD		84.46
trkE		29.00
trmA		89.69
trmB		7.20
trmC		50.45
trmD		56.81
trmEF		83.80
trnA		59.50
trpABCDEG		27.72
trpP		83.82
trpR		99.70
trpS		74.31
trpT		84.77
trxA		85.16
trxB		19.20
ts8		63.42
tsf		4.17
tsp		40.42
tsr		98.95
tsx		9.18
tufA		73.06
tufB		89.96
tus		35.64
tynA		26.80
tyrA		56.60
tyrB		91.95
tyrP		42.21
tyrR		29.20
tyrS		36.00
tyrTV		27.15
tyrU		89.93
ubiAC		91.76
ubiB		87.11
ubiDE		86.60
ubiF		14.95
ubiG		48.25
ubiH		63.01
ubiX		49.85
udhA		89.68
udk		44.65
udp		86.40
ugpABCEQ		75.83
uhpABCT		82.61
uidAR		35.70
umuCD		25.93
uncABDEFI		84.12
ung (1)		55.83
upp		53.70
ups		25.45
urfA		37.20
usg (1,2)		49.99
ushA		11.30
uspA		121.00
uup		21.45
uvrA		92.10
uvrB		17.51
uvrC		42.37
uvrD		85.87
uxaA		67.90
uxaB		34.50
uxaC		67.91
uxuABR		98.20
valS		96.73
valU		52.00
valV		36.20
valW		36.20
visA		10.90
visBC		63.00
vsr		42.91
weeA		66.75
witA		56.22
x96		96.00
xapAR		52.40
xerB		96.77
xerC		85.86
xseA		53.93
xseB		9.65
xthA		38.31
xylAB		79.70
xylE		91.46
xylose		124.01
xylRF		79.75
zhg		75.16
zwf		40.82