CLAIMS

1. A method of producing a product by a cell, the method comprising:

excising one or more nucleic acid sequences from a chromosome in the cell, wherein the one or more nucleic acid sequences comprises a gene of interest and an origin of replication;

forming an extra-chromosomal DNA molecule, wherein the extra-chromosomal DNA molecule comprises the excised gene of interest and an excised origin of replication; and

inducing expression of the gene of interest from the extra-chromosomal DNA molecule.

2. The method of claim 1, wherein the expression of the gene of interest from the extra-chromosomal DNA molecule is induced by formation of the extra-chromosomal DNA molecule.

3. The method of claim 1, wherein the expression of the gene of interest from the extra-chromosomal DNA molecule is induced at the same time as, or after, formation of the extra-chromosomal DNA molecule.

4. The method of any one of the preceding claims, wherein the gene of interest is a heterologous gene of interest.

5. The method of any one of the preceding claims, wherein the gene of interest encodes the product or an enzyme required for producing said product.

6. The method of any one of the preceding claims, wherein the one or more nucleic acid sequences does not comprise a selectable marker.

7. The method of any one of the preceding claims, wherein the one or more nucleic acid sequences comprises a second origin of replication.

8. The method of claim 7, wherein the extra-chromosomal DNA molecule comprises the excised second origin of replication.

9. The method of any one of the preceding claims, wherein the origin of replication or the second origin of replication is an endogenous or non-inducible origin of replication.

10. The method of any one of the preceding claims, wherein as a result of the method, the chromosome does not comprise a functional origin of replication.

11. The method of any one of the preceding claims, wherein the excising step and the forming step take place simultaneously or sequentially.

12. The method of any one of the preceding claims, wherein the extra-chromosomal DNA molecule is a plasmid.

13. The method of any one of the preceding claims, wherein the one or more nucleic acid sequences is one nucleic acid sequence.

14. The method of any one of the preceding claims, comprising inducing replication of the extra-chromosomal DNA molecule.

15. The method of claim 14, wherein the replication of the extra-chromosomal DNA molecule is induced by formation of the extra-chromosomal DNA molecule.

16. The method of claim 14 or claim 15, wherein the excising and forming steps take place simultaneously or sequentially with one or both of the inducing steps.

17. The method of any one of the preceding claims, wherein the cell exists within a cell population, and wherein the excising step and/or the forming step take place during the exponential growth phase of the cell population; preferably wherein the cell is a bacterial cell which exists within a bacterial cell population, and wherein the excising step and/or the forming step take place during the exponential growth phase of the bacterial cell population.

18. The method of any one of the preceding claims, wherein the origin of replication and/or the second origin of replication is non-inducible; preferably a chromosomal origin of replication or *oriC*; more preferably *Escherichia coli oriC*.

19. The method of any one of the preceding claims, wherein the origin of replication and/or the second origin of replication is inducible; preferably a plasmid origin of replication or *oriV*; more preferably the origin of replication or oriV of plasmid RK2, pBR322, pMB1, ColE1, R6K, p15A, pSC101 or pUC.

20. The method of any one of the preceding claims, comprising collecting the product.

21. A method of producing a product by a cell, the method comprising:

excising one or more nucleic acid sequences from a chromosome in the cell, wherein the one or more nucleic acid sequences comprises a gene of interest and an origin of replication;

forming an extra-chromosomal DNA molecule, wherein the extra-chromosomal DNA molecule comprises the excised gene of interest and an excised origin of replication; and

inducing replication of the extra-chromosomal DNA molecule.

22. The method of any one of the preceding claims, wherein the extra-chromosomal DNA molecule does not comprise an antibiotic resistance gene.

23. A cell, wherein the cell comprises a chromosome comprising a nucleic acid sequence flanked by site-specific recombination sites for recognition by site-specific recombinase,

wherein said nucleic acid sequence comprises a gene of interest, an origin of replication, and a promoter, and wherein:

the promoter is positioned such that the promoter may be operatively linked with the gene of interest by excision and circularisation of the nucleic acid sequence by site-specific recombination using the site-specific recombination sites; and/or

the promoter is positioned such that the promoter may be operatively linked with a gene for regulating the activity of the origin of replication by excision and circularisation of the nucleic acid sequence by site-specific recombination using the site-specific recombination sites.

24. The cell of claim 23, wherein the site-specific recombination sites comprise site-specific recombination sites for recognition by a serine recombinase, preferably wherein the serine recombinase is γδ, Bxb1, φC31 or TP901, and/or wherein the site-specific recombination sites comprise site-specific recombination sites for recognition by a tyrosine recombinase, preferably wherein the tyrosine recombinase is Cre, Dre, Flp, KD, B2 or B3.

25. The cell of claim 23 or claim 24, wherein the site-specific recombination sites comprise a pair of site-specific recombination sites, and/or wherein the site-specific recombination sites comprise two or more pairs of site-specific recombination sites.

26. The cell of any one of claims 23 to 25, further comprising a gene encoding the site-specific recombinase.

27. The cell of claim 26, wherein the gene encoding the site-specific recombinase is operatively linked to a promoter, preferably wherein the promoter is temperature-sensitive, pH-sensitive, light-sensitive, or chemically-sensitive; more preferably wherein the promoter is regulated by phage lambda cl857 repressor.

28. The method of any one of claims 1 to 22, wherein the cell is as defined in any one of claims 23 to 27.

29. A polynucleotide vector comprising a gene of interest, an origin of replication, and site-specific recombination sites, wherein the site-specific recombination sites flank the gene of interest and the origin of replication, preferably wherein said polynucleotide vector comprises a nucleic acid sequence flanked by site-specific recombination sites for recognition by site-specific recombinases as defined in any one of claims 23 to 25.

30. Use of the cell of any one of claims 23 to 27, or the polynucleotide vector of claim 29, for producing a product.

31. The cell of any one of claims 23 to 27, for use in the treatment or prevention of a disease or pathology, preferably wherein the disease or pathology is cancer, metabolic disease or an immunological disorder.

32. The method, cell, polynucleotide vector, use, or cell for use, of any one of claims 1 to 31, wherein the cell is a bacterial cell, preferably wherein the bacterial cell is *Escherichia* sp., *Bacillus* sp., *Lactococcus* sp., *Streptococcus* sp., *Lactobacillus* sp., *Corynebacterium* sp., *Streptomyces* sp., *Pseudomonas* sp., *Clostridium* sp., *Xanthomonas sp*, or *Enterobacteriaceae*.