CLAIMS

1. An engineered, non-naturally occurring system comprising

(a) a Cpf1 effector protein, and

(b) at least one engineered guide polynucleotide designed to form a complex with the Cpf1effector protein and comprising a guide sequence, in which the guide sequence is designed to hybridize with a target sequence in a eukaryotic cell; and

in which the system lacks a tracr sequence, the engineered guide polynucleotide and Cpf1 effector protein do not naturally occur together, and a complex of the engineered guide polynucleotide and Cpf1 effector protein does not naturally occur.

2. An engineered, non-naturally occurring system comprising

(a) one or more nucleotide sequences encoding a Cpf1 effector protein, and

(b) one or more nucleotide sequences encoding at least one engineered guide polynucleotide designed to form a complex with the Cpf1 effector protein and comprising a guide sequence, in which the guide sequence is designed to hybridize with a target sequence in a eukaryotic cell; and

in which the system lacks a tracr sequence, the engineered guide polynucleotide and Cpf1 effector protein do not naturally occur together, and a complex of the engineered guide polynucleotide and Cpf1 effector protein does not naturally occur.

3. An engineered, non-naturally occurring vector system comprising one or more vectors comprising

(a) a first regulatory element operably linked to one or more nucleotide sequences encoding a Cpf1 effector protein;

(b) a second regulatory element operably linked to one or more nucleotide sequences encoding at least one engineered guide polynucleotide designed to form a complex with the Cpf1 effector protein and comprising a guide sequence, in which the guide sequence is designed to hybridize with a target sequence in a eukaryotic cell; and

in which the system lacks a tracr sequence, components (a) and (b) are located on the same or different vectors of the system, the engineered guide polynucleotide and Cpf1

effector protein do not naturally occur together, and a complex of the engineered guide polynucleotide and Cpf1 effector protein does not naturally occur.

4. An engineered, non-naturally occurring system comprising

(a) a Cpf1 effector protein, or one or more nucleotide sequences encoding the Cpf1 effector protein, and

(b) at least one engineered guide polynucleotide designed to form a complex with the Cpf1 effector protein and comprising a guide sequence, in which the guide sequence is designed to hybridize with a target sequence in a eukaryotic cell, or one or more nucleotide sequences encoding the at least one engineered guide polynucleotide;

in which the system lacks a tracr sequence, the engineered guide polynucleotide and Cpf1 effector protein do not naturally occur together, and a complex of the engineered guide polynucleotide and Cpf1 effector protein does not naturally occur.

5. A system according to Claim 4, comprising the at least one engineered guide polynucleotide.

6. A system according to Claim 4, comprising the one or more nucleotide sequences encoding the Cpf1 effector protein.

7. A system according to Claim 4, comprising the Cpf1 effector protein.

8. A system according to Claim 4, comprising the one or more nucleotide sequences encoding the at least one engineered guide polynucleotide.

9. A system according to any of Claims 1 to 4, in which the complex of the at least one engineered guide polynucleotide and the Cpf1 effector protein causes cleavage distally of the target sequence.

10. A system according to Claim 9, in which the cleavage generates a staggered double stranded break with a 4- or 5-nt 5′ overhang.

11. A system according to any of Claims 1 to 4, in which the target sequence is 3′ of a Protospacer Adjacent Motif (PAM) and the PAM comprises a 5′ T-rich motif.

12. A system according to any of Claims 1 to 4, in which the Cpf1 effector protein is of a bacterial species listed in FIG. 64A or FIG. 64B.

13. A system according to Claim 12, in which the bacterial species is selected from the group consisting of *Francisella tularensis 1, Prevotella albensis, Lachnospiraceae bacterium MC2017 1, Butyrivibrio proteoclasticus, Peregrinibacteria bacterium GW2011_GWA2_33_10, Parcubacteria bacterium GW2011_GWC2_44_17, Smithella sp. SCADC, Acidaminococcus sp. BV3L6, Lachnospiraceae bacterium MA2020, Candidatus Methanoplasma termitum, Eubacterium eligens, Moraxella bovoculi 237, Leptospira inadai, Lachnospiraceae bacterium ND2006, Porphyromonas crevioricanis 3, Prevotella disiens* and *Porphyromonas macacae*.

14. A system according to any of Claims 1 to 4, in which the target sequence is 3′ of a Protospacer Adjacent Motif (PAM) and the PAM sequence is TTN, where N is A/C/G or T and the Cpf1 effector protein is FnCpf1, or the PAM sequence is TTTV, where V is A/C or G and the Cpf1 effector protein is PaCpf1p, LbCpf1 or AsCpf1.

15. A system according to any of Claims 1 to 4, in which the Cpf1 effector protein comprises one or more nuclear localization signals.

16. A system according to Claim 2, 3, or 4, in which the one or more nucleotide sequences encoding the Cpf1 effector protein is/are codon optimized for expression in a eukaryotic cell.

17. A system according to Claim 2, 3, or 4, in which components (a) and (b) are on one vector.

18. A system according to Claim 2 or 4, in which the one or more nucleotide sequences of components (a) and (b) are a single nucleic acid molecule.

19. A system according to any of Claims 1 to 4, in which the eukaryotic cell is an animal or human cell.

20. A system according to any of Claims 1 to 4, in which the eukaryotic cell is a plant cell.

21. A system according to any of Claims 1 to 4, in which the guide sequence is linked to a direct repeat sequence.

22. A system according to any of Claims 1 to 4, in which the complex, engineered guide polynucleotide or Cpf1 effector protein is conjugated to at least one sugar moiety.

23. A system according to Claim 22, in which the sugar moiety comprises N-acetyl galactosamine (GalNAc) or triantennary GalNAc.

24. A system according to any of Claims 1 to 4, in which the engineered guide polynucleotide comprises at least one modified nucleotide.

25. A delivery particle comprising a system according to any of Claims 1 to 4.

26. A delivery particle according to Claim 25, in which the Cpf1 effector protein is complexed with the engineered guide polynucleotide.

27. A delivery particle according to Claim 25, further comprising a lipid, a sugar, a metal or a protein.

28. A delivery particle according to Claim 26, further comprising a lipid, a sugar, a metal or a protein.

29. An *in vitro or ex vivo* method of modifying a locus of interest having a target sequence of a eukaryotic cell comprising delivering a system according to any of Claims 1 to 4, to the locus of interest, in which the guide sequence hybridizes with the target sequence whereby modification of the locus of interest occurs.

30. A method according to Claim 29, in which the locus of interest is within a eukaryotic cell.

31. A method according to Claim 30, in which the cell is an animal cell.

32. A method according to Claim 30, in which the cell is an animal or human cell.

33. A method according to Claim 30, in which the cell is a plant cell.

34. A method according to Claim 30, in which the delivering the system comprises delivering one or more nucleotide sequences encoding the Cpf1 effector protein and one or more nucleotide sequences encoding the at least one engineered guide polynucleotide.

35. A method according to Claim 34, in which the one or more nucleotide sequences are comprised within one or more vectors.

36. A method according to Claim 34, in which the one or more nucleotide sequences are comprised within a single vector.

37. A method according to Claim 34, in which the one or more nucleotide sequences molecules are delivered via delivery particles, vesicles, or one or more viral vectors.

38. A method according to Claim 30, in which the system or a component thereof is delivered via delivery particles, delivery vesicles, or one or more viral vectors.

39. A method according to Claim 38, in which the system is delivered via delivery particles, delivery vesicles, or one or more viral vectors.

40. A method according to Claim 38, in which the delivery particles comprise a lipid, a sugar, a metal or a protein.

41. A method according to Claim 38, in which the delivery vesicles are exosomes or liposomes.

42. A method according to Claim 38, in which the one or more viral vectors are one or more adenoviruses, one or more lentiviruses or one or more adeno-associated viruses.

43. A method according to Claim 30, in which the Cpf1 effector protein comprises one or more nuclear localization signals.

44. A method according to Claim 30, in which the eukaryotic cell comprises a stem cell or stem cell line.

45. A method according to Claim 29, in which the locus of interest is within a eukaryotic DNA molecule *in vitro*.

46. A method according to Claim 33, in which the method comprises obtaining a plant having a modified trait of interest from the plant cell.

47. A method according to Claim 33, in which the method comprises identifying a trait of interest in a plant obtained from the plant cell, in which the trait of interest is encoded by a gene of interest.

48. A method according to Claim 47, further comprising introducing the identified gene of interest into a plant cell or a plant cell line or plant germplasm and generating therefrom a plant containing the gene of interest.

49. A method according to Claim 48, in which the plant exhibits the trait of interest.

50. A method according to Claim 29, in which the modification comprises a strand break.

51. A method according to Claim 50, in which the strand break comprises a staggered DNA double stranded break with a 4- or 5-nt 5′ overhang.

52. A method according to Claim 51, in which the modification comprises integration of a DNA insert into the staggered DNA double stranded break.

53. A method according to Claim 29, including adding a cation.

54. An isolated eukaryotic cell comprising a system according to any of Claims 1 to 8.

55. A cell of according to Claim 54, in which the eukaryotic cell is an animal cell.

56. A cell of according to Claim 54, in which the eukaryotic cell is a human cell.

57. A cell of according to Claim 54, in which the eukaryotic cell comprises a stem cell or stem cell line.

58. A cell of according to Claim 54, in which the eukaryotic cell is a plant cell.