What is claimed is:

1. A recombinant viral capsid protein that is genetically modified to display a heterologous amino acid sequence comprising a first member of a protein:protein binding pair ("first member") inserted into the viral capsid protein,

wherein the viral capsid protein is derived from a *cap* gene of an adeno-associated virus (AAV) that encodes an AAV VP1, VP2, and/or VP3 capsid protein;

wherein:

(a) the first member of the protein:protein binding pair is a peptide tag and is capable of forming an isopeptide bond with a second cognate member of the protein:protein binding pair ("second cognate member"); or

(b) the first member is a peptide tag and the viral capsid protein further comprises a second cognate member of the protein:protein binding pair ("second cognate member"), wherein the first member and second cognate member are bound by an isopeptide bond.

2. The recombinant viral capsid protein of claim 1, wherein the viral capsid protein further comprises the second cognate member, wherein the first member and second cognate member are bound by an isopeptide bond.

3. The recombinant viral capsid protein of claim 1 or claim 2, wherein the viral capsid protein is derived from a chimeric AAV *cap* gene.

4. The recombinant viral capsid protein of any one of the preceding claims, wherein the viral capsid protein further comprises a mutation in addition to the first member of the protein:protein binding pair.

5. The recombinant viral capsid protein of any one of the preceding claims, wherein:

(a) the first member reduces or abolishes the natural tropism of the viral capsid protein; and/or

(b) the viral capsid protein further comprises a mutation in addition to the first member, that reduces or abolishes the natural tropism of the viral capsid protein.

6. The recombinant viral capsid protein of any one of the preceding claims, wherein:

(a) the first member is flanked by a first linker and/or second linker that link(s) the first member to the viral capsid protein, and wherein the first linker and/or second linker is each independently at least one amino acid in length;

(b) the viral capsid protein further comprises a mutation at an amino acid position involved with binding of the viral capsid protein to its natural receptor, wherein the mutation comprises an insertion of a heterologous peptide into the viral capsid protein, substitution of one or more amino acids of the viral capsid protein with a heterologous peptide, deletion of one or more amino acids of the viral capsid protein, or a combination thereof;

(c) the AAV is selected from the group consisting of AAV1, AAV2, AAV3, AAV4, AAV5, AAV6, AAV7, AAV8 and AAV9;

(d) the protein:protein binding pair is:

(i) SpyTag:SpyCatcher,

(ii) SpyTag:KTag,

(iii) Isopeptag:pilin-C,

(iv) SnoopTag:SnoopCatcher,

(v) SpyTag002:SpyCatcher002; or

(e) any combination of (a)-(d).

7. The recombinant viral capsid protein of claim 5 or 6, wherein the viral capsid protein comprises a tropism that is:

(a) restored;

(b) redirected; or

(c) restored and redirected,

upon formation of the isopeptide bond with the second cognate member, wherein the second cognate member is fused with a targeting ligand that specifically binds a target cell.

8. The recombinant viral capsid protein of any one of claims 2-7, wherein:

(a) the first member is SpyTag and the second cognate member is SpyCatcher or KTag;

(b) the first member is KTag and the second cognate member is SpyTag;

(c) the first member is SnoopTag and the second cognate member is SnoopCatcher;

(d) the first member is isopeptag and the second cognate member is Pilin-C; or

(e) the first member is SpyTag002 and the second cognate member is SpyCatcher002.

9. The recombinant viral capsid protein of any one of claims 2-7, wherein the second cognate member is linked to a targeting ligand.

10. The recombinant viral capsid protein of claim 9, wherein:

(a) the targeting ligand is a binding moiety;

(b) the targeting ligand is an antibody, or an antigen-binding portion thereof;

(c) the second cognate member linked to the targeting ligand comprises an amino acid sequence set forth as SEQ ID NO:46;

(d) the targeting ligand specifically binds a cell surface molecule; or

(e) any combination of (a)-(d).

11. The recombinant viral capsid protein of claim 10, wherein the binding moiety is an antibody, or an antigen-binding portion thereof, wherein:

(a) the antibody, or the antigen-binding portion thereof, is fused to SpyCatcher;

(b) the antibody, or the antigen-binding portion thereof, is fused to SpyCatcher, wherein the antibody, or the antigen-binding portion thereof, is fused to a linker at the C-terminus, and the linker is fused to SpyCatcher at the linker's C-terminus; or

(c) the antibody, or the antigen-binding portion thereof, is fused to SpyCatcher, wherein the antibody, or the antigen-binding portion thereof, is fused to a linker at the C-terminus, and the linker is fused to SpyCatcher at the linker's C-terminus, wherein the linker comprises a sequence set forth as SEQ ID NO:48 (GSGESG).

12. The recombinant viral capsid protein of claim 10, wherein the targeting ligand specifically binds a cell surface molecule which is:

(i) asialoglycoprotein 1 (ASGR1),

(ii) human ectonucleoside triphosphate diphosphohydrolase 3 (ENTPD3),

(iii) Protein Tyrosine Phosphatase Receptor Type N (PTPRN),

(iv) CD20,

(v) CD63,

(vi) Her2; or

(vii) transferrin receptor 2.

13. The recombinant viral capsid protein of claim 10, wherein:

(a) the targeting ligand specifically binds a molecule expressed by a neuronal cell; or

(b) the targeting ligand specifically binds transferrin receptor expressed by a neuronal cell.

14 The recombinant viral capsid protein of claim 10, wherein the targeting ligand specifically binds a molecule expressed by a muscle cell.

15. A recombinant viral capsid comprising the recombinant viral capsid protein of any one of claims 1-14.

16. The recombinant viral capsid of claim 15, wherein the recombinant viral capsid further comprises a reference viral capsid protein lacking any member of the specific binding pair.

17. The recombinant viral capsid of claim 16, comprising the recombinant viral capsid protein and the reference viral capsid protein at a ratio between 1:1 and 1:15.

18. A recombinant viral particle comprising a nucleotide of interest encapsulated by the recombinant viral capsid of any one of claims 15-17.

19. A composition comprising: (a) the recombinant viral particle of claim 18; and (b) a pharmaceutically acceptable carrier.

20. The recombinant viral particle of claim 18 or the composition of claim 19 for use in therapy, wherein the recombinant viral capsid protein comprises a targeting ligand that specifically binds a protein expressed on the surface of a target cell.

21. The recombinant viral particle or the composition for use according to claim 20, wherein:

(a) the target cell is *in vivo* in a subject;

(b) the target cell is *in vivo* in a human subject; and/or

(c) the target cell is a human target cell.

22. The recombinant viral particle or the composition for use according to claim 21, wherein:

(i) the target cell is a human liver cell, and wherein the targeting ligand binds human asialoglycoprotein receptor (ASGR1);

(ii) the target cell is a human neuronal cell, and wherein the targeting ligand binds GABA;

(iii) the target cell is a human T cell, and wherein the targeting ligand binds CD3;

(iv) the target cell is a human T cell, and wherein the targeting ligand binds CD3ε;

(v) the target cell is a human hematopoietic cell, and wherein the targeting ligand binds CD34;

(vi) the target cell is a human kidney cell;

(vii) the target cell is a human cancer cell, and wherein the targeting ligand binds a tumor associated antigen; or

(viii) the target cell is a human cancer cell, and wherein the targeting ligand binds a tumor associated antigen, wherein the tumor associated antigen is E6, E7 or Her2.

23. The recombinant viral particle or the composition for use according to claim 21, wherein:

(i) the targeting ligand binds PTPRN;

(ii) the targeting ligand binds CD20;

(iii) the targeting ligand binds human glucagon receptor; or

(iv) the targeting ligand specifically binds CD63; or

(v) the targeting ligand binds human ectonucleoside triphosphate diphosphohydrolase 3 (hENTPD3).

24. A method of delivering a nucleotide of interest to an *in vitro* target cell comprising contacting the target cell with the recombinant viral particle of claim 18 or the composition of claim 19, wherein the viral capsid protein comprises a targeting ligand that specifically binds a protein expressed on the surface of the target cell.

25. The method of claim 24, wherein:

(i) the target cell is a human liver cell, and wherein the targeting ligand binds human asialoglycoprotein receptor (ASGR1);

(ii) the target cell is a human neuronal cell, and wherein the targeting ligand binds GABA;

(iii) the target cell is a human T cell, and wherein the targeting ligand binds CD3;

(iv) the target cell is a human T cell, and wherein the targeting ligand binds CD3ε;

(v) the target cell is a human hematopoietic cell, and wherein the targeting ligand binds CD34;

(vi) the target cell is a human kidney cell;

(vii) the target cell is a human cancer cell, and wherein the targeting ligand binds a tumor associated antigen; or

(viii) the target cell is a human cancer cell, and wherein the targeting ligand binds a tumor associated antigen, wherein the tumor associated antigen is E6, E7 or Her2.

26. The method of claim 24, wherein:

(i) the targeting ligand binds PTPRN;

(ii) the targeting ligand binds CD20;

(iii) the targeting ligand binds human glucagon receptor; or

(iv) the targeting ligand specifically binds CD63;

(v) the targeting ligand specifically binds hENTPD3; or

(vi) the targeting ligand specifically binds transferrin receptor 2.

27. A recombinant vector encoding the recombinant viral capsid protein of any one of claims 1-14.

28. An AAV *cap* gene encoding the recombinant viral capsid protein of any one of claims 1-14.