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 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; or

(b) the first member of the protein:protein binding pair is a peptide tag and the viral capsid protein further comprises the second cognate member of the protein:protein binding pair, 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 of the protein:protein binding pair, 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 capsid protein; and/or

(b) the viral capsid protein further comprises a mutation in addition to the first member of the protein:protein binding pair, that reduces or abolishes the natural tropism of the 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 and/or second linker that link(s) the first member to the viral capsid protein, and wherein the first 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 capsid protein, substitution of one or more amino acids of the capsid protein with a heterologous peptide, deletion of one or more amino acids of the 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 tropism of the viral capsid protein is:

(a) restored;

(b) redirected; or

(c) restored and redirected,

upon formation of the isopeptide bond with the second cognate member, which 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 a portion thereof;

(c) 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 portion thereof, wherein:

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

(b) the antibody, or portion thereof, is fused to SpyCatcher, wherein the antibody, or 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 portion thereof, is fused to SpyCatcher, wherein the antibody, or 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) 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 viral capsid protein of any one of claims 1-14.

16. The recombinant viral capsid of claim 15, wherein the viral capsid protein 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 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 viral capsid protein of any one of claims 15-17.

19. A composition comprising: (a) the viral capsid protein of any one of claims 15-17 or the viral particle of claim 18; and (b) a pharmaceutically acceptable carrier.

20. Use of the viral particle of claim 18 or the composition of claim 19 in the manufacture of a medicament treating a condition associated with targeted delivery of therapeutic cargo to specific cells, wherein a nucleotide of interest is to be delivered to a target cell, wherein the

target cell is contacted with the viral particle or composition, and wherein the viral capsid protein comprises a targeting ligand that specifically binds a protein expressed on the surface the target cell.

21. The use of the viral particle or composition 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 use of the viral particle or composition 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 antigen is E6, E7 or Her2.

23. The use of the viral particle or composition according to claim 21, wherein:
    (i) the targeting ligand binds PTPRN (Protein Tyrosine Phosphatase Receptor Type N);
    (ii) the targeting ligand binds CD20;
    (iii) the targeting ligand binds human glucagon receptor; or
    (iv) the targeting ligand specifically binds CD63 or 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 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 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 CD63hENTPD3; or

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

27. A recombinant vector encoding the 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.