WHAT IS CLAIMED IS:

1. An adeno-associated virus (AAV) capsid protein comprising at least 3, 4, 5, 6, 7, 8, or 9 contiguous amino acids of an amino acid sequence set forth in any one of SEQ ID NO: 1-1232.
2. The AAV capsid protein of claim 1, wherein the amino acid sequence comprises at least 3, 4, 5, 6, 7, 8, or 9 contiguous amino acids of the amino acid sequence set forth in SEQ ID NO: 71 (YVNIMDDMD).
3. The AAV capsid protein of claim 1 or claim 2, wherein the AAV capsid protein comprises serotype AAV2.
4. The AAV capsid protein of claim 3, wherein the serotype AAV2 comprises SEQ ID NO: 1233.
5. The AAV capsid protein of claim 4, wherein the amino acid sequence is inserted into the AAV2 capsid protein between amino acids 588 and 589.
6. The AAV capsid protein of claim 1 or claim 2, wherein the AAV capsid protein comprises serotype AAV9.
7. The AAV capsid protein of claim 6, wherein the serotype AAV9 comprises a sequence having at least 80% sequence identity to the sequence set forth in SEQ ID NO: 1234.
8. The AAV capsid protein of claim 7, wherein the amino acid sequence is inserted into the AAV9 capsid protein between amino acids 587 and 590.
9. The AAV capsid protein of claim 6, wherein the AAV capsid protein comprises a sequence having at least 80% sequence identity to the sequence set forth in SEQ ID NO: 1235.
10. The AAV capsid protein of claim 9, wherein the AAV capsid protein comprises the sequence set forth in SEQ ID NO: 1235.
11. The AAV capsid protein of claim 1, wherein the AAV capsid protein comprises an amino acid sequence set forth in any one of SEQ ID NO: 1-1232.
12. The AAV capsid protein of claim 2, wherein the AAV capsid protein comprises an amino acid sequence set forth in SEQ ID NO: 71 (YVNIMDDMD).
13. The AAV capsid protein of claim 1 or claim 2, wherein the amino acid sequence is inserted into any of the parental capsids AAV1, AAV2, AAV3B, AAV5, AAV6, AAV8, AAV9, AAV3, AAV4, AAV7, AAV11, AAVrh10, AAVrh39, or AAVrh74.
14. The AAV capsid protein of claim 13, wherein the amino acid sequence is inserted into any of the parental capsids AAV2 or AAV9.

15. The AAV capsid protein of claim 1, wherein the amino acid sequence is inserted into a surface exposed region of the AAV capsid.
16. A CNS-targeting molecule, comprising at least 3, 4, 5, 6, 7, 8, 9, or all contiguous amino acids of an amino acid sequence set forth in any of SEQ ID NO: 1-1232.
17. The CNS-targeting molecule of claim 25, wherein the amino acid sequence comprises at least 3, 4, 5, 6, 7, 8, or 9 contiguous amino acids of the amino acid sequence set forth in SEQ ID NO: 71 (YVNIMDDMD).
18. A CNS-targeting molecule, of claim 25 or claim 26, wherein the amino acid sequence is fused or conjugated to a small molecule, antibody, scFV, ASO, siRNA, lipid, polymer, or recombinant protein.