WHAT IS CLAIMED IS:

1. A nanocage comprising a plurality of first fusion proteins and a plurality of second fusion proteins, wherein

(i) the first fusion protein comprises N-ferritin and a Fab fragment capable of specifically binding to a first antigen, and

(ii) the second fusion protein comprises C-ferritin and a Fab fragment capable of specifically binding to a second antigen,

wherein, within each fusion protein, the Fab fragment is fused to the N-terminus of the N-ferritin or the C-ferritin, and wherein the first antigen is distinct from the second antigen.

2. A nanocage comprising a plurality of first fusion proteins, a plurality of second fusion proteins, and a plurality of third fusion proteins, wherein

(a) the first fusion protein comprises a ferritin light chain and a Fab fragment capable of specifically binding a first antigen,

(b) the second fusion protein comprises a C-ferritin and a Fab fragment capable of specifically binding a second antigen, and

(c) the third fusion protein comprises an N-ferritin and an Fc fragment, wherein, within each fusion protein the Fab or Fc fragment is fused to the N-terminus of the ferritin light chain, the C-ferritin, or the N-ferritin, and

wherein the first antigen is distinct from the second antigen.

3. The nanocage of claim 2 or 3, further comprising a plurality of fourth fusion proteins, wherein, the fourth fusion protein comprises a C-ferritin and a Fab fragment capable of specifically binding a third antigen, wherein the third antigen is distinct from the first and second antigens.

4. The nanocage of any one of claims 1-3, wherein the Fab fragments are Fab fragments of a neutralizing antibody.

5. The nanocage of any one of claims 1-4, wherein the first and second antigens are each associated with an infectious agent.

6. The nanocage of claim 5, wherein the first and second antigens are associated with the same infectious agent.

7. The nanocage of claim 5 or 6, wherein the infectious agent is a virus.

8. The nanocage of claim 7, wherein the virus is a human immunodeficiency virus (HIV).

9. The nanocage of claim 4, wherein the first and second antigens are each associated with a virus, wherein the nanocage is capable of neutralizing 100% of pseudoviruses in a panel of pseudoviruses, and wherein the panel of pseudoviruses comprises, for each Fab fragment within the nanocage capable of specifically binding to an antigen associated with the virus, at least one pseudovirus resistant to a neutralizing antibody corresponding to that Fab fragment.

10. The nanocage of claim 9, wherein the panel of pseudoviruses comprises at least 10, at least 11, at least 12, at least 13, or at least 14 pseudoviruses.

11. The nanocage of any one of claims 4, 9, or 10, wherein the first and second antigens are each associated with a virus, wherein the nanocage is capable of neutralizing a panel of pseudoviruses with an IC50 of less than 1 nM, less than 500 pM, less than 250 pM, less than 100 pM, less than 50 pM, less than 10 pM, or less than 5 pM, and wherein the panel of pseudoviruses comprises, for each Fab fragment within the nanocage capable of specifically binding to an antigen associated with the virus, at least one pseudovirus resistant to a neutralizing antibody corresponding to that Fab fragment.

12. The nanocage of any one of claims 4 or 9-11, wherein the first and second antigens are each associated with a virus, wherein the nanocage is capable of neutralizing a panel of pseudoviruses with an IC50 (molar concentration) of at least 10-fold, at least 20-fold, at least 30-fold, at least 40-fold, at least 50-fold, at least 60-fold, at least 70-fold, at least 80-fold, at least 90-fold, or at

least 100-fold lower than that of one or more controls, and wherein the panel of pseudoviruses comprises, for each Fab fragment within the nanocage capable of specifically binding to an antigen associated with the virus, at least one pseudovirus resistant to a neutralizing antibody corresponding to that Fab fragment.

13. The nanocage of claim 12, wherein the one or more controls comprise a neutralizing antibody corresponding to a Fab fragment within the nanocage, which Fab fragment is capable of specifically binding to an antigen associated with the virus.

14. The nanocage of claim 13, wherein the neutralizing antibody is an IgG antibody.

15. The nanocage of any one of claims 12-14, wherein the one or more controls comprise a cocktail of neutralizing antibodies, wherein the cocktail comprises, for each Fab fragment within the nanocage capable of specifically binding to an antigen associated with the virus, a neutralizing antibody corresponding to that Fab fragment.

16. A fusion protein comprising:

a first nanocage monomer subunit of a nanocage monomer; and

a bioactive moiety linked to the first nanocage monomer subunit;

wherein the fusion protein self-assembles with a protein comprising a second nanocage monomer subunit to form a nanocage monomer, wherein the first and second nanocage monomer subunits interchangeably comprise the “N” and “C” regions of apoferritin.

17. The fusion protein of claim 16, wherein the bioactive moiety decorates the interior and/or exterior surface of the nanocage monomer.

18. The fusion protein of claim 16 or 17, wherein the bioactive moiety comprises an antibody or fragment thereof, an antigen, a detectable moiety, a pharmaceutical agent, a diagnostic agent, or combinations thereof.

19. The fusion protein of claim 18, wherein the antibody or fragment thereof comprises an Fc fragment.

20. The fusion protein of claim 19, wherein the Fc fragment is an IgG1 Fc fragment.

21. The fusion protein of claim 18, wherein the antibody or fragment thereof comprises a Fab fragment.

22. The fusion protein of claim 18, wherein the antibody or fragment thereof comprises a scFab fragment, a scFv fragment, or a sdAb fragment.

23. The fusion protein of claim 18, wherein the antibody or fragment thereof comprises a heavy and/or light chain of a Fab fragment.

24. The fusion protein of claim 23, wherein the antibody or fragment thereof comprises both a light chain and a heavy chain, or in the case of a Fc fragment, a first and a second chain.

25. The fusion protein of claim 24, wherein the linker comprises or consists of the sequence:

GGSSGSGSGSTGTSSSGTGTSAGTTGTSASTSGSGSGGGGGSGGGGSAGGTAT AGASSGSGSSGSSSSGGTG.

26. The fusion protein of claim 23, in association with a separately produced Fab light chain and/or heavy chain.

27. The fusion protein of any one of claims 18 to 26, wherein the antibody or fragment thereof binds specifically to an antigen associated with an antibody-preventable and/or antibody-treatable condition.

28. The fusion protein of claim 27, wherein antigen is associated with an infectious agent, including a virus (e.g., HIV, including HIV-1, influenza, RSV, rotavirus), bacteria (e.g., TB, C.

difficile) parasite (e.g., malaria), fungus, or yeast, a cancer (e.g., CD19, CD22, CD79, BCMA, or CD20), including solid and liquid cancers, or an immune disease, including an autoimmune disease.

29. The fusion protein of claim 28, wherein the antigen is associated with HIV-and the antibody or fragment thereof comprises, for example, Ibalizumab-A12P, 10E8, 10E8.v4, N49P7, PGDM1400, 10-1074, VRC01, or a Fab thereof.

30. The fusion protein of claim 29, wherein the antibody or fragment thereof comprises or consists of the sequence:

Fc chain:
DKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTIS
KAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPP
VLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVLHEALHSHYTQKSLSLSPGK;

Ibalizumab-A12P light chain:
DIVMTQSPDSLPVSLGERVTMNCKSSQSLLYSTNQKNYLAWYQQKPGQSPKLLIYWAS
TRESGVPDRFSGSGSGTDFTLTISSVQAEDVAVYYCQQYYSYRTFGGGTKLEIKRTVAAP
SVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKDST
YSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC;

Ibalizumab-A12P heavy chain:
QVQLQQSGPEVVKPGASVKMSCKASGYTFTSYVIHWVRQKPGQGLDWIGYINPYNDGT
DYDEKFKGKATLTSDTSTSTAYMELSSLRSEDTAVYYCAREKDNYATGAWFAYWGQG
TLVTVSSASTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTSGVHTF
PAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGSR;

10E8.v4 light chain:
SELTQDPAVSVALKQTVTITCRGDSLRSHYASWYQKKPGQAPVLLFYGKNNRPSGIPDR
FSGSASGNRASLTITGAQAEDEADYYCSSRDKSGSRLSVFGGGTKLTVLSQPKAAPSVTL
FPPSSEELQANKATLVCLISDFYPGAVTVAWKADSSPVKAGVETTTPSKQSNNKYAASS
YLSLTPEQWKSHRSYSCQVTHEGSTVEKTVAPTEC;

10E8.v4 heavy chain:
EVRLVESGGGLVKPGGSLRLSCSASGFDFDNAWMTWVRQPPGKGLEWVGRITGPGEG
WSVDYAESVKGRFTISRDNTKNTLYLEMNNVRTEDTGYYFCARTGKYYDFWSGYPPG
EEYFQDWGQGTLVIVSSASTKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWN
SGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTKVDKKVEPKS
CSR;

N49P7 light chain:
QSALTQPRSVSASPGQSVTISCTGTHNLVSWCQHQPGRAPKLLIYDFNKRPSGVPDRFSG
SGSGGTASLTITGLQDDDDAEYFCWAYEAFGGGTKLTVLGQPKAAPSVTLFPPSSEELQ
ANKATLVCLISDFYPGAVTVAWKADSSPVKAGVETTTPSKQSNNKYAASSYLSLTPEQ
WKSHRSYSCQVTHEGSTVEKTVAPTEC;

N49P7 heavy chain:
ADLVQSGAVVKKPGDSVRISCEAQGYRFPDYIIHWIRRAPGQGPEWMGWMNPMGGQV
NIPWKFQGRVSMTRDTSIETAFLDLRGLKSDDTAVYYDRSNGSGKRFESSNWFLDLWG
RGTAVTIQSASTKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGALTSGVH
TFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTKVDKKVEPKSCDSR;

PGDM1400 light chain:
DFVLTQSPHSLSVTPGESASISCKSSHSLIHGDRNNYLAWYVQKPGRSPQLLIYLASSRAS
GVPDRFSGSGSDKDFTLKISRVETEDVGTYYCMQGRESPWTFGQGTKVDIKRTVAAPSV
FIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKDSTYS
LSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC;

PGDM1400 heavy chain:
QAQLVQSGPEVRKPGTSVKVSCKAPGNTLKTYDLHWVRSVPGQGLQWMGWISHEGDK
KVIVERFKAKVTIDWDRSTNTAYLQLSGLTSGDTAVYYCAKGSKHRLRDYALYDDDGA
LNWAVDVDYLSNLEFWGQGTAVTVSSASTKGPSVFPLAPSSKSTSGGTAALGCLVKDY
FPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNT
KVDKKVEPKSCDSR; or
combinations thereof.

31. The fusion protein of any one of claims 18 to 30, wherein the antibody or fragment thereof is conjugated to or associated with a further moiety.

32. The fusion protein of claim 31, wherein the antibody or fragment thereof is conjugated to a drug.

33. The fusion protein of claim 18, wherein the antigen is associated with a vaccine-preventable and/or vaccine-treatable condition.

34. The fusion protein of claim 33, wherein antigen is associated with an infectious agent, including a virus, bacteria, parasite, fungus, or yeast, a cancer, including solid and liquid cancers, or an immune disease, including an autoimmune disease.

35. The fusion protein of claim 18, wherein the detectable moiety comprises a fluorescent protein.

36. The fusion protein of claim 18, wherein the pharmaceutical agent comprises a small molecule, peptide, lipid, carbohydrate, or toxin.

37. The fusion protein of any one of claims 16 to 36, wherein from 3 to 100 nanocage monomers self-assemble to form a nanocage.

38. The fusion protein of any one of claims 16 to 37, wherein the first nanocage monomer and the second nanocage monomer are both selected from the group consisting of ferritin, apoferritin, encapsulin, SOR, lumazine synthase, pyruvate dehydrogenase, carboxysome, vault proteins, GroEL, heat shock protein, E2P, and MS2 coat protein.

39. The fusion protein of claim 38, wherein the nanocage monomer is apoferritin.

40. The fusion protein of claim 16, wherein the "N" region of apoferritin comprises or consists of the sequence:

MSSQIRQNYSTDVEAAVNSLVNLYLQASYTYLSLGFYFDRDDVALEGVSHFFRELA EEKREGYERLLKMQNQRGGRALFQDIKKPAEDEW.

41. The fusion protein of claim 16 or 40, wherein the "C" region of apoferritin comprises or consists of the sequence:

GKTPDAMKAAMALEKKLNQALLDLHALGSARTDPHLCDFLETHFLDEEVKLIKKMG OHLTNLHRLGGPEAGLGEYLFERLTLRHD.

42. The fusion protein of any one of claims 16 to 41, further comprising a linker between the nanocage monomer subunit and the bioactive moiety.

43. The fusion protein of claim 42, wherein the linker comprises from 1 to 30 amino acid residues.

44. The fusion protein of claim 42 or 43, wherein the linker comprises a GGS repeat.

45. The fusion protein of claim 44, wherein the linker comprises or consists of the sequence

ASTASSASSGGGGGGSGGSGGSGGS.

46. The fusion protein of any one of claims 16 to 45, further comprising a C-terminal linker.

47. The fusion protein of claim 46, wherein the C-terminal linker comprises or consists of the sequence:

GGSGGSGGSGGSGGGASGGS.

48. A pair of fusion proteins, each fusion protein as claimed in any one of claims 16 to 47, wherein the pair self-assembles to form a nanocage monomer, wherein the first and second nanocage monomer subunits are fused to different bioactive moieties.

49. A nanocage comprising at least one fusion protein of any one of claims 16 to 47 and at least one second nanocage monomer subunit that self-assembles with the fusion protein to form a nanocage monomer.

50. A nanocage comprising at least one pair of claim 48.

51. The nanocage of claim 49 or 50, wherein each nanocage monomer comprises the fusion protein of any one of claims 16 to 47 or the pair of claim 48.

52. The nanocage of claim 49 or 50, wherein from 20% to 80% of the nanocage monomers comprise the fusion protein of any one of claims 16 to 48 or the pair of claim 49.

53. The nanocage of any one of claims 49 to 52, comprising at least 2, 3, 4, 5, 6, 7, 8, 9, or 10 different bioactive moieties.

54. The nanocage of any one of claims 49 to 53, comprising at least one whole nanocage monomer.

55. The nanocage of any one of claims 49 to 54, wherein the nanocage is multivalent and/or multispecific.

56. The nanocage of any one of claims 49 to 55, comprising:
a first fusion protein, a second fusion protein, and a third fusion protein, wherein each of the first, second, and third fusion proteins comprises the fusion protein as claimed in any one of claims 16 to 47; and
at least one whole nanocage monomer fused to a bioactive moiety, wherein the bioactive moieties of the first, second, and third fusion proteins and of the whole nanocage monomer are all different from one another.

57. The nanocage of claim 56, wherein the first, second, and third fusion proteins each comprise an antibody or fragment thereof fused to N- or C-ferritin, wherein at least one of the first, second, and third fusion proteins is fused to N-ferritin and at least one of the first, second, and third fusion proteins is fused to C-ferritin.

58. The nanocage of claim 57, wherein the antibody or fragment thereof of the first fusion protein is an Fc fragment; wherein the second and third fusion proteins each comprise an antibody or fragment thereof specific for a different antigen of a virus or wherein the second fusion protein comprises an antibody or fragment thereof specific for an antigen of a virus and the third fusion protein comprises an antibody or fragment thereof specific for a different antigen; and wherein the whole nanocage monomer is fused to a bioactive moiety that is specific for another different antigen.

59. The nanocage of claim 58, wherein the antibody or fragment thereof of the second fusion protein is N49P7 or ibalizumab A12P; wherein the antibody or fragment thereof of the third fusion protein is 10E8v4.

60. The nanocage of claim 59, comprising the following four fusion proteins:

a. PGDM1400 Fab fused to full length ferritin;

b. Fc fused to N-ferritin;

c. N49P7 Fab or ibalizumab A12P Fab fused to C-ferritin; and

d. 10E8v4 Fab fused to C-ferritin.

61. The nanocage of claim 60, comprising a 4:2:1:1: ratio of a:b:c:d.

62. The nanocage of claim 60 or 61, comprising or consisting of sequences identical to one or more of the following sequences, where ferritin subunits are in bold, linkers are underlined, light chains are italicized, and heavy chains are in lowercase:

a. PGDM1400-hFerr:
DFVLTQSPHSLSVTPGESASISCKSSHSLIHGDRNNYLAWYVQKPGRSPQLLIYLASSRAS
GVPDRFSGSGSDKDFTLKISRVETEDVGTYYCMQGRESPWTFGQGTKVDIKRTVAAPSV
FIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKDSTYS
LSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGECGGSSGSGSGSTGTSSSGTGT
SAGTTGTSASTSGSGSGGGGGSGGGGSAGGTATAGASSGSGSSGSSSSGGTGqaqlvqsgpe
vrkpgtsvkvsckapgntlktydlhwvrsvpgqglqwmgwishegdkkviverfkakvtidwdrstntaylqlsgltsgdtavyyca
kgskhrlrdyalydddgalnwavdvdylsnlefwgqgtavtvssastkgpsvfplapsskstsggtaalgclvkdyfpepvtvswnsg
altsgvhtfpavlqssglyslssvvtvpssslgtqtyicnvnhkpsntkvdkkvepkscdsrASTASSASSGGGGGGSGGS
GGSGGSMSSQIRQNYSTDVEAAVNSLVNLYLQASYTYLSLGFYFDRDDVALEGVSHFFR
ELAEEKREGYERLLKMQNQRGGRALFQDIKKPAEDEWGKTPDAMKAAMALEKKLNQ
ALLDLHALGSARTDPHLCDFLETHFLDEEVKLIKKMGDHLTNLHRLGGPEAGLGEYLFE
RLTLRHDGGSGGSGGSGGSGGGASGGS;

b. Fc-N-hFerr LS
DKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTIS
KAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPP
VLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVLHEALHSHYTQKSLSLSPGKGGSSGSGS
GSTGTSSSGTGTSAGTTGTSASTSGSGSGGGGGSGGGGSAGGTATAGASSGSGSSGSSSS
GGTGdkthtcppcpapellggpsvflfppkpkdtlmisrtpevtcvvvdvshedpevkfnwyvdgvevhnaktkpreeqynstyr
vvsvltvlhqdwlngkeykckvsnkalpapiektiskakgqprepqvytlppsreemtknqvsltclvkgfypsdiavewesngqpe
nnykttppvldsdgsfflyskltvdksrwqqgnvfscsvlhealhshytqkslslspgksrASTASSASSGGGGGSGGS

GGSGGSMSSQIRQNYSTDVEAAVNSLVNLYLQASYTYLSLGFYFDRDDVALEGVSHFFR
ELAEEKREGYERLLKMQNQRGGRALFQDIKKPAEDEW;

c1. N49P7-C-hFerr

QSALTQPRSVSASPGQSVTISCTGTHNLVSWCQHQPGRAPKLLIYDFNKRPSGVPDRFSG
SGSGGTASLTITGLQDDDDAEYFCWAYEAFGGGTKLTVLGQPKAAPSVTLFPPSSEELQ
ANKATLVCLISDFYPGAVTVAWKADSSPVKAGVETTTPSKQSNNKYAASSYLSLTPEQ
WKSHRSYSCQVTHEGSTVEKTVAPTECGGSSGSGSGSTGTSSSGTGTSAGTTGTSASTSG
SGSGGGGGSGGGGSAGGTATAGASSGSGSSGSSSSGGTGadlvqsgavvkkpgdsvrisceaqgyrfp
dyiihwirrapgqgpewmgwmnpmggqvnipwkfqgrvsmtrdtsietafldlrglksddtavyycvrdrsngsgkrfessnwfl
dlwgrgtavtiqsastkgpsvfplapsskstsggtaalgclvkdyfpepvtvswnsgaltsgvhtfpavlqssglyslssvvtvpssslgtq
tyicnvnhkpsntkvdkkvepkscdsrASTASSASSGGGGGSGGSGGSGGSGKTPDAMKAAMALE
KKLNQALLDLHALGSARTDPHLCDFLETHFLDEEVKLIKKMGDHLTNLHRLGGPEAGL
GEYLFERLTLRHDGGSGGSGGSGGSGGGASGGS;

c2. Ibalizumab-A12P-C-hFerr

DIVMTQSPDSLPVSLGERVTMNCKSSQSLLYSTNQKNYLAWYQQKPGQSPKLLIYWAS
TRESGVPDRFSGSGSGTDFTLTISSVQAEDVAVYYCQQYYSYRTFGGGTKLEIKRTVAA
PSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKDS
TYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGECGGSSGSGSGSTGTSSSG
TGTSAGTTGTSASTSGSGSGGGGGSGGGGSAGGTATAGASSGSGSSGSSSSGGTGqvqlqq
sgpevvkpgasvkmsckasgytftsyvihwvrqkpgqgldwigyinpyndgtdydekfkgkatltsdtststaymelsslrsedtavy
ycarekdnyatgawfaywgqgtlvtvssastkgpsvfplapcsrstsestaalgclvkdyfpepvtvswnsgaltsgvhtfpavlqssgl
yslssvvtvpssslgtktytcnvdhkpsntkvdkrveskygsrASTASSASSGGGGGSGGSGGSGGSGKTPD
AMKAAMALEKKLNQALLDLHALGSARTDPHLCDFLETHFLDEEVKLIKKMGDHLTNL
HRLGGPEAGLGEYLFERLTLRHDGGSGGSGGSGGSGGGASGGS; or

d. 10E8.v4-C-hFerr

SELTQDPAVSVALKQTVTITCRGDSLRSHYASWYQKKPGQAPVLLFYGKNNRPSGIPDR
FSGSASGNRASLTITGAQAEDEADYYCSSRDKSGSRLSVFGGGTKLTVLSQPKAAPSVTL
FPPSSEELQANKATLVCLISDFYPGAVTVAWKADSSPVKAGVETTTPSKQSNNKYAASS
YLSLTPEQWKSHRSYSCQVTHEGSTVEKTVAPTECGGSSGSGSGSTGTSSSGTGTSAGTT

GTSASTSGSGSGGGGGSGGGGSAGGTATAGASSGSGSSGSSSSGGTGevrlvesggglvkpggslr lscsasgfdfdnawmtwvrqppgkglewvgritgpgegwsvdyaesvkgrftisrdntkntlylemnnvrtedtgyyfcartgkyyd fwsgyppgeeyfqdwgqgtlvivssastkgpsvfplapsskstsggtaalgclvkdyfpepvtvswnsgaltsgvhtfpavlqssglys lssvvtvpssslgtqtyicnvnhkpsntkvdkkvepkscsrASTASSASSGGGGGGSGGSGGSGGSGKTPDA MKAAMALEKKLNQALLDLHALGSARTDPHLCDFLETHFLDEEVKLIKKMGDHLTNLH RLGGPEAGLGEYLFERLTLRHDGGSGGSGGSGGSGGGASGGS.

63. The nanocage of any one of claims 49 to 62, carrying a cargo molecule.

64. The nanocage of claim 63, wherein the cargo molecule is not fused to the fusion protein and is contained in the nanocage internally.

65. The nanocage of claim 63, wherein the cargo molecule is a protein and is fused to the fusion protein such that the cargo molecule is contained in the nanocage internally.

66. The nanocage of any one of claims 63 to 65, wherein the cargo molecule is a fluorescent protein.

67. The nanocage of any one of claims 63 to 66, wherein the cargo molecule is contained internally to provide T-cell epitopes.

68. The nanocage of any one of claims 63 to 66, wherein the cargo molecule is fused to the fusion protein and contained internally to provide T-cell epitopes.

69. The nanocage of claim 63 to 64, wherein the cargo molecule is a small molecule, radioisotope, or magnetic particle.

70. The nanocage of any one of claims 49 to 69, further comprising an antigen on the surface.

71. The nanocage of claim 70, wherein the antigen is expressed as a fusion protein with a nanocage monomer.

72. A vaccine comprising the nanocage of any one of claims 49 to 71.

73. A therapeutic or prophylactic composition comprising the nanocage of any one of claims 49 to 71.

74. A nucleic acid molecule encoding the fusion protein of any one of claims 16 to 47 or the pair of claim 48.

75. A vector comprising the nucleic acid molecule of claim 74.

76. A host cell comprising the vector of claim 75 and producing the fusion protein of any one of claims 16 to 47 or the pair of claim 48.

77. Use of the nanocage of any one of claims 49 to 71 in the manufacture of a medicament, or use of the vaccine of claim 72 as the medicament for treating HIV in a subject.

78. Use of the fusion protein of any one of claims 16 to 47, the pair of claim 48, or the nanocage of any one of claims 49 to 71 in FACS or in an ELISA.

79. The nanocage of any one of claims 49 to 71 or the vaccine of claim 72 for use in immunizing a subject.

80. The nanocage of any one of claims 49 to 71 or the vaccine of claim 72 for use in treating and/or preventing HIV in a subject.

81. The nanocage of any one of claims 49 to 71 for use in diagnostic imaging of a subject, tissue, or sample, wherein the nanocage comprises a diagnostic label.

82. The fusion protein of any one of claims 16 to 47, the pair of claim 48, or the nanocage of any one of claims 39 to 71 for use in FACS or in an ELISA.