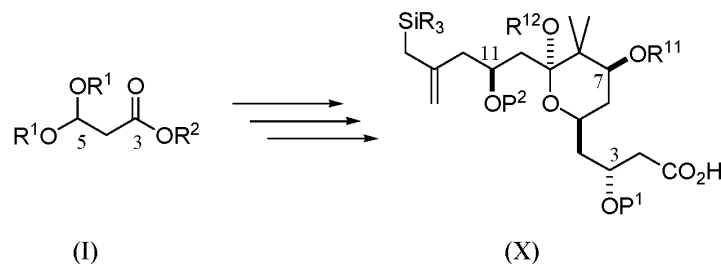


What is claimed is:

1. A method of preparing a bryostatin compound, wherein the method comprises:

- (a) preparing a compound of formula (X) from a starting material of formula (I) or a synthon thereof or a synthetic equivalent thereof:



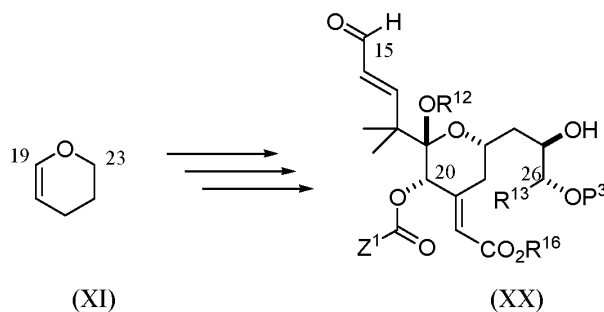
wherein:

P¹ and P² are independently a hydroxyl protecting group or synthetic equivalent thereof;
each R and R¹-R² is independently an alkyl or a substituted alkyl;

R¹² is an alkyl or a substituted alkyl; and

R¹¹ is an acyl, a substituted acyl, an alkyl, a substituted alkyl, -CO-aryl, -CO(substituted aryl), -CO-heteroaryl, or -CO(substituted heteroaryl); and

- (b) preparing a compound of formula (XX) from a starting material of formula (XI) or a synthon thereof or a synthetic equivalent thereof:



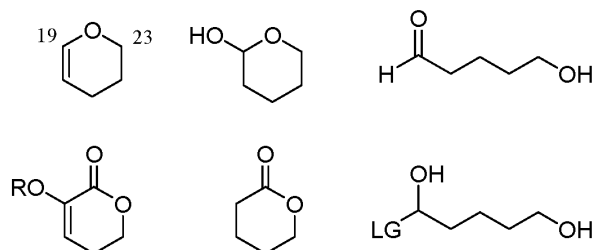
wherein:

Z¹ is an alkynyl, a substituted alkynyl, an allenyl, a substituted allenyl an alkyl or a substituted alkyl (e.g., including one or more O or N atoms in the carbon chain, or substituted with a cycloalkyl, substituted cycloalkyl, cyclic alkenyl, substituted cyclic alkenyl, aryl, substituted aryl, heteroaryl, or substituted hereoaryl);

R¹², R¹³ and R¹⁶ are independently an alkyl or a substituted alkyl; and

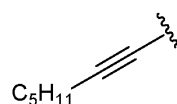
P³ is H or a hydroxyl protecting group.

2. The method of claim 1, wherein step (a) comprises 10 synthetic steps or fewer; step (b) comprises 13 synthetic steps or fewer; and the starting material of formula (XI) or a synthon thereof or a synthetic equivalent thereof is selected from one of the following:



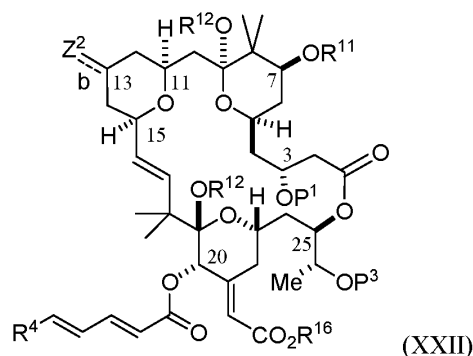
3. The method of any one of claims 1-2, wherein Z^1 comprises 4-10 carbons.

4. The method of claim 3, wherein Z^1 is:



5. The method of any one of claims 1-4, further comprising:

- (c) coupling the compound of formula (X) and the compound of formula (XX) via esterification and macrocyclization (or vice versa) to produce a macrocyclic compound; and
 (d) preparing a compound of formula (XXII) from the macrocyclic compound (e.g., via an oxidative cleavage, such as an osmylation / diol cleavage, or an ozonolysis reaction):



wherein:

R^4 is an alkyl or a substituted alkyl;

Z^2 is $=CR^5R^6$ or $=NR^7$ when the covalent bond designated "b" is a double bond;

Z^2 is $-OR^8$ or $-N(R^7)_2$ when the covalent bond designated "b" is a single bond; and

R^5 , R^6 , R^7 and R^8 are each independently H, alkyloxycarbonyl, substituted alkyloxycarbonyl, alkyl or substituted alkyl;

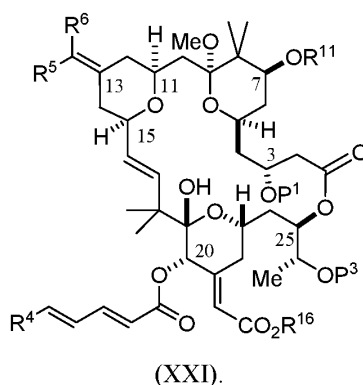
P^1 and P^3 are independently H or a hydroxyl protecting group;

R^{11} is H, an acyl, a substituted acyl, an alkyl or a substituted alkyl;

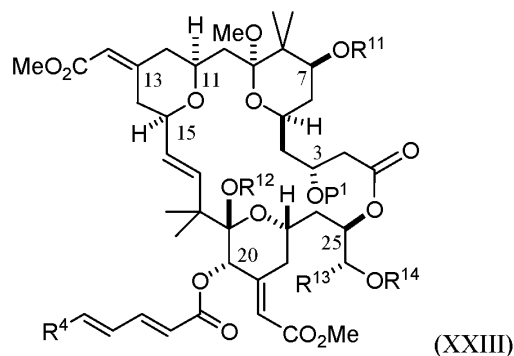
R^{12} is H, an alkyl or a substituted alkyl; and

R^{16} is H, an alkyl or a substituted alkyl.

6. The method of claim 5, further comprising deprotecting a protected hydroxy group to produce a bryostatin compound having a free hydroxyl group.
7. The method of claim 6, further comprising preparing a prodrug of the bryostatin compound.
8. The method of claim 5, wherein the macrocyclic compound is of formula (XXI):



9. The method of any one of claims 5-8, wherein the bryostatin compound has the structure of formula (XXIII);

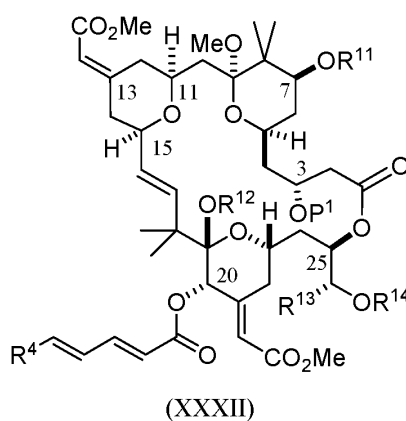


wherein:

R¹³ is an alkyl or a substituted alkyl; and

R¹⁴ is H, a hydroxyl protecting group or a promoiety.

10. The method of any one of claims 5-8, wherein the bryostatin compound has the structure of formula (XXXII):

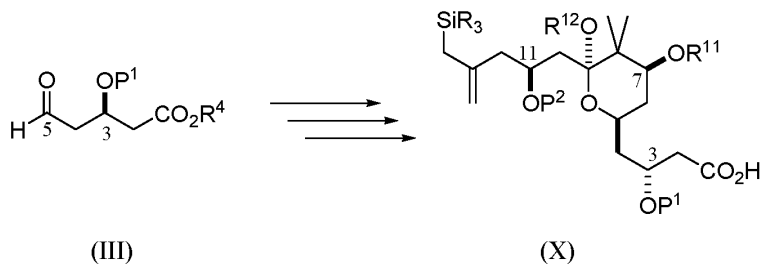


wherein:

R¹³ is an alkyl or a substituted alkyl; and

R¹⁴ is H, a hydroxyl protecting group or a promoiety.

11. The method of any one of claims 1-10, wherein step (a) comprises a method of preparing the compound of formula (X) from a compound of formula (III):



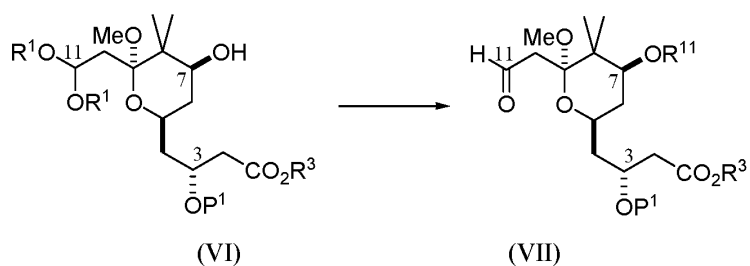
wherein:

P¹ and P² are independently H or a hydroxyl protecting group;

R⁴ is H, an alkyl or a substituted alkyl; each R and R¹² is an alkyl or a substituted alkyl; and

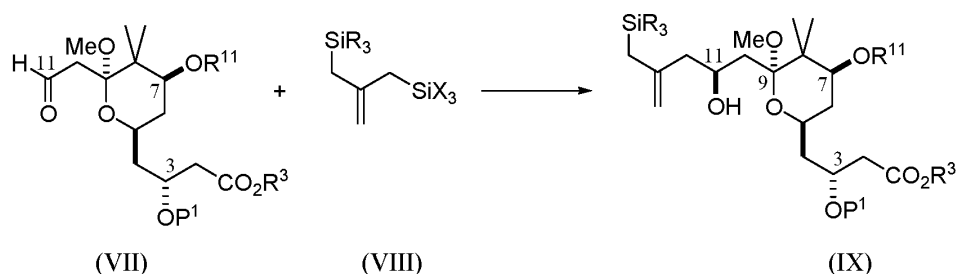
R¹¹ is an acyl, a substituted acyl, an alkyl or a substituted alkyl.

12. The method of any one of claims 1-11, wherein step (a) comprises preparing a compound of formula (VII) from a compound of formula (VI):



wherein R^3 is H, an alkyl or a substituted alkyl.

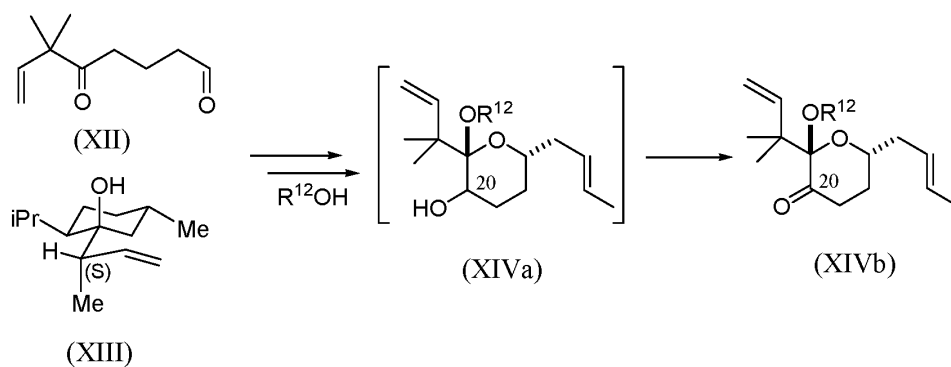
13. The method of any one of claims 1-12, wherein step (a) comprises reacting a compound of formula (VII) with a compound of formula (VIII) to stereoselectively produce a compound of formula (IX):



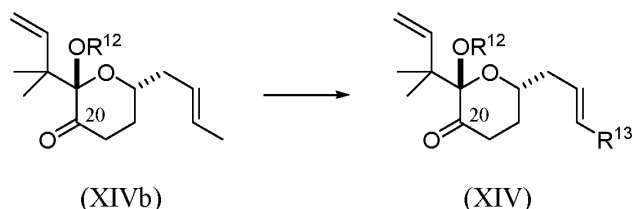
wherein:

- each R and R^3 is alkyl or a substituted alkyl; and
- each X is a leaving group.

14. The method of any one of claims 1-13, wherein step (b) comprises preparing a compound of formula (XIVb) from compounds of formula (XII) and (XIII) via intermediate (XIVa):



15. The method of any one of claims 1-13, wherein step (b) comprises preparing a compound of formula (XIV) from a compound of formula (XIVb) via a metathesis reaction:

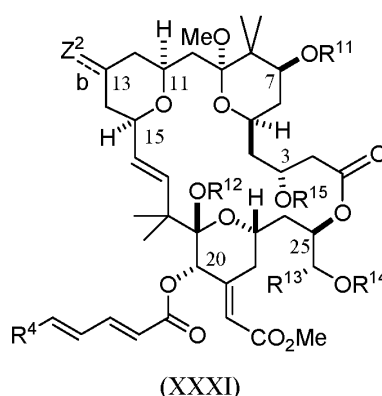


wherein R^{13} is an alkyl comprising at least two carbons or a substituted alkyl.

16. A method of preparing a bryostatin compound or a precursor thereof, wherein the method comprises one or more steps according to any one of the steps depicted in FIG. 1 to FIG. 9.

17. The method of any one of claims 1-15, wherein the bryostatin compound or precursor thereof is bryostatin 1.

18. A bryostatin analog having the formula (XXXI):



wherein:

R^4 is an alkyl or a substituted alkyl;

Z^2 is CR^5R^6 or NR^7 when the covalent bond designated "b" is a double bond;

Z^2 is OR^8 or $N(R^7)_2$ when the covalent bond designated "b" is a single bond;

R^5 , R^6 , R^7 and R^8 are each independently H, alkyloxycarbonyl, substituted alkyloxycarbonyl, alkyl or substituted alkyl;

R^{11} is an acyl, a substituted acyl, an alkyl or a substituted alkyl;

R^{12} is H, an alkyl or a substituted alkyl;

R^{13} is H, an alkyl or a substituted alkyl; and

R^{14} and R^{15} are independently H, a hydroxyl protecting group or a promoiety;
or a solvate, hydrate or prodrug form thereof and/or a salt thereof.

19. The bryostatin analog of claim 18, wherein R^{14} is a promoiety.
20. A pharmaceutical composition comprising a therapeutically effective amount of a bryostatin analog of any one of claims 17-19 and a pharmaceutically acceptable vehicle.