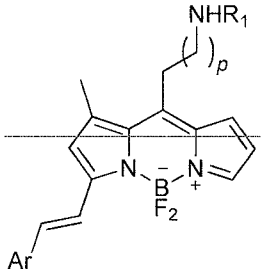
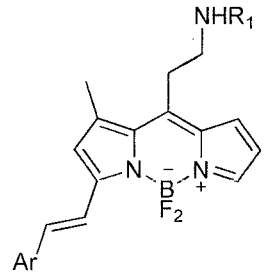
CLAIMS

What is claimed is:

1. A compound represented by structural Formula (I) or pharmaceutically acceptable salts thereof:

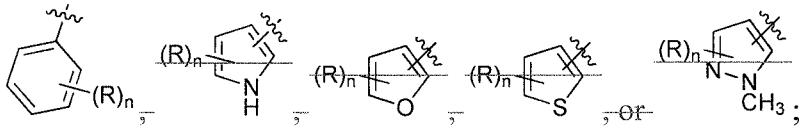


~~(I)~~



(I)

wherein:

Ar is 

~~, or~~ ;

each R is independently selected from H, OH, halogen, nitro, amino, $(C_1\text{-}C_6)$alkyl, $(C{=}O)(C_{0\text{-}}C_6)$alkyl, (C=O)H, $(C{=}O)O(C_{0\text{-}}C_6)$alkyl, $NH(C{=}O)(C_{0\text{-}}C_6)$alkyl, OCF_3, $CH{=}CH(C_0\text{-}C_6)$alkyl aryl, $O(C_{1\text{-}2}\text{-}C_6)$alkenyl, $(C_0\text{-}C_6)$alkylCH=O, $O(C_1\text{-}C_6)$alkyl, $S(C_1\text{-}C_6)$alkyl, $S(C_1\text{-}C_6)$haloalkyl, $O(C_1\text{-}C_6)$haloalkyl, $OCHF_2$, $O(C_{0\text{-}}C_6)$alkylamino, $(C_6\text{-}C_{10})$aryl, $(C_5\text{-}C_{10})$heteroaryl, $(C_5\text{-}C_{10})$heterocyclyl, $(C_1\text{-}C_6)$alkyl aryl, $O(C_0\text{-}C_6)$alkyl aryl, $O(CH_2)_mCHCH_2$ or ~~1~~2-5-membered polycyclyl ring fused to Ar, creating a polycyclic ring system, wherein each ~~1~~2-5-membered polycycle optionally and independently contains 1-2 ring heteroatoms selected from oxygen, nitrogen and sulfur;

n is 1, 2, 3 or 4;

m is 0, 1, 2, 3 or 4;

~~*p* is 1, 2, 3, 4, or 5;~~

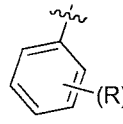
wherein, when n is 2 or greater, the R substituents may be optionally taken together to form a fused polycyclic aromatic ring system;

and wherein each R is optionally substituted with 1-4 R_2 substituents independently selected from:

H, $(C_1$-$C_6)$alkyl, halo$(C_{01}$-$C_6)$alkyl, hydroxy$(C_{01}$-$C_6)$alkyl, $(C_6$-$C_{10})$aryl, halo $(C_6$-$C_{10})$aryl, hydroxy$(C_6$-$C_{10})$aryl, O$(C_1$-$C_6)$alkyl, O$(C_1$-$C_6)$haloalkyl, $(C_3$-$C_8)$cycloalkyl, halo$(C_6$-$C_{10})$aryl$(C_1$-$C_6)$alkoxy, halogen, amino, $(C_1$-$C_6)$alkoxy$(C_6$-$C_{10})$aryl$(C_1$-$C_6)$alkoxy, nitro, hydroxy, ~~halogen,~~ $(C_0$-$C_6)$alkyl$(C_6$-$C_{10})$aryl$(C_0$-$C_6)$alkoxy, $(C_5$-$C_{10})$heterocycle, OCF_3, ~~amino,~~ O$(C_1$-$C_6)$alkylamino, $(C_6$-$C_{10})$aryl$(C_2$-$C_6)$alkenyl, $(C_2$-$C_6)$alkenyl$(C_1$-$C_6)$alkoxy, $(C_1$-$C_6)$sulfoxy, (C=O)O$(C_{01}$-$C_6)$alkyl or $N(CH_3)(C_1$-$C_6)$OH;

R_1 is H, C=O$(C_0$-$C_6)$haloalkyl, C=O$(C_0$-$C_6)$alkyl, C=O$(C_0$-$C_6)$alkylene or C=O$(C_6$-$C_{10})$aryl.

2. The compound of Claim 1, wherein:

Ar is 

;

R is CH=CH$(C_0$-$C_6)$alkyl aryl; and

n is 1.

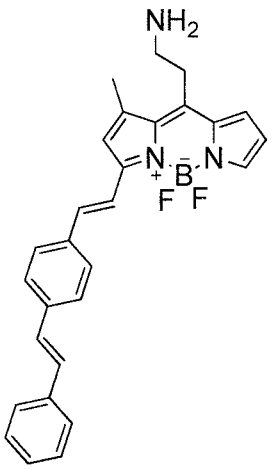
3. The compound of Claim 2, wherein:

R is (CH=CH)phenyl.

4. The compound of Claim ~~3~~ 2, wherein:

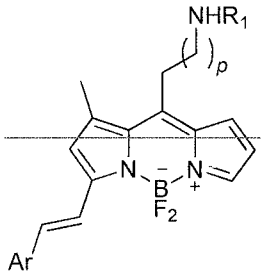
each R_2 is independently H, halogen, $(C_1$-$C_6)$haloalkyl or $(C_1$-$C_6)$alkyl .

5. The compound of claim 4, wherein the compound is represented by structural Formula (II):

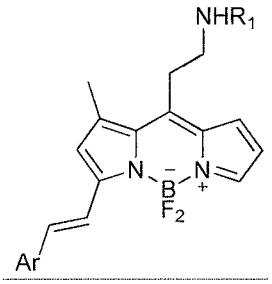


(II)

6. A method for a solid phase synthesis of a compound of structural Formula (I) or pharmaceutically acceptable salts thereof:

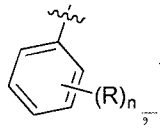
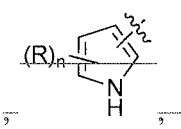
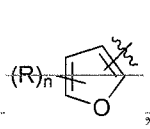
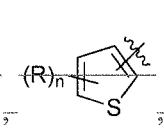
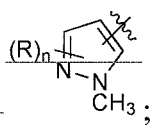


~~(I)~~



(I)

wherein:

Ar is     ~~, or~~  ;

each R is independently selected from H, OH, halogen, nitro, amino, $(C_1\text{-}C_6)$alkyl, $(C{=}O)(C_{0\text{-}1}\text{-}C_6)$alkyl, (C=O)H, $(C{=}O)O(C_{0\text{-}1}\text{-}C_6)$alkyl, $NH(C{=}O)(C_{0\text{-}1}\text{-}C_6)$alkyl, OCF_3, $CH{=}CH(C_0\text{-}C_6)$alkylaryl, $O(C_{1\text{-}2}\text{-}C_6)$alkenyl, $(C_0\text{-}C_6)$alkylCH=O, $O(C_1\text{-}C_6)$alkyl, $S(C_1\text{-}C_6)$alkyl, $S(C_1\text{-}C_6)$haloalkyl, $O(C_1\text{-}C_6)$haloalkyl, $OCHF_2$, $O(C_{0\text{-}1}$-

C_6)alkylamino, (C_6-C_{10})aryl, (C_5-C_{10})heteroaryl, (C_5-C_{10})heterocyclyl, (C_1-C_6)alkyl aryl, O(C_0-C_6)alkyl aryl, O$(CH_2)_mCHCH_2$ or ~~1~~2-5-membered polycyclyl ring fused to Ar, creating a polycyclic ring system, wherein each ~~1~~2-5-membered polycycle optionally and independently contains 1-2 ring heteroatoms selected from oxygen, nitrogen and sulfur;

n is 1, 2, 3 or 4;

m is 0, 1, 2, 3 or 4;

~~*p* is 1, 2, 3, 4, or 5;~~

wherein, when n is 2 or greater, the R substituents may be optionally taken together to form a fused polycyclic aromatic ring system;

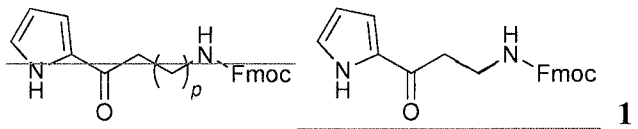
and wherein each R is optionally substituted with 1-4 R_2 substituents independently selected from:

H, (C_1-C_6)alkyl, halo(C_0-C_6)alkyl, hydroxy(C_0-C_6)alkyl, (C_6-C_{10})aryl, halo(C_6-C_{10})aryl, hydroxy(C_6-C_{10})aryl, O(C_1-C_6)alkyl, O(C_1-C_6)haloalkyl, (C_3-C_8)cycloalkyl, halo(C_6-C_{10})aryl(C_1-C_6)alkoxy, halogen, amino, (C_1-C_6)alkoxy(C_6-C_{10})aryl(C_1-C_6)alkoxy, nitro, hydroxy, ~~halogen,~~ (C_0-C_6)alkyl(C_6-C_{10})aryl(C_0-C_6)alkoxy, (C_5-C_{10})heterocycle, OCF_3, ~~amino,~~ O(C_1-C_6)alkylamino, (C_6-C_{10})aryl(C_2-C_6)alkenyl, (C_2-C_6)alkenyl(C_1-C_6)alkoxy, (C_1-C_6)sulfoxy, (C=O)O(C_0-C_6)alkyl or N(CH_3)(C_1-C_6)OH;

R_1 is H, C=O(C_0-C_6)haloalkyl, C=O(C_0-C_6)alkyl, C=O(C_0-C_6)alkylene or C=O(C_6-C_{10})aryl;

comprising the steps of:

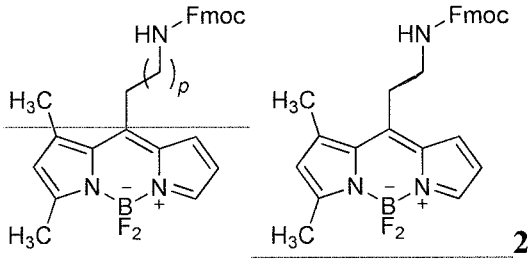
a) reacting an Fmoc-protected amino acid and pyrrole to prepare 2-ketopyrrole (a derivative **1**):



1

~~wherein *p* is an integer from 1 to 5;~~

b) condensing derivative **1** with 2,4-dimethylpyrrole and an activating agent, and adding $BF_3 \cdot OEt_2$ *in situ* to obtain derivative **2**:

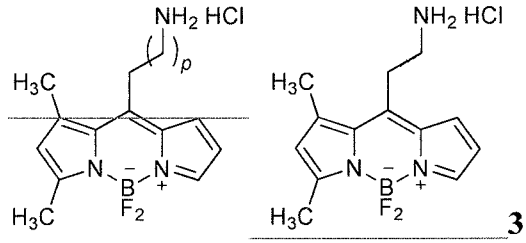


2

~~wherein *p* is an integer from 1 to 5;~~

c) reacting derivative **2** with a base;

d) quenching the reaction mixture of step c) with an aqueous HCl to produce derivative **3**:



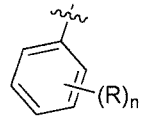
3

~~wherein *p* is an integer from 1 to 5;~~

e) loading derivative **3** on ~~CTC-PS resin, so that the activated C_3-methyl group of the derivative is modified in a solid-phase adapted Knoevenagel-type reaction~~ 2-chlorotrityl chloride polystyrene resin to produce a loaded resin; and

f) reacting the loaded resin from step e) with an aldehyde to produce the compound of Formula I, and subsequently extracting the compound of Formula I from step e) by a solid-phase extraction.

7. The method of Claim 6, wherein:

Ar is 

;

R is CH=CH(C_0-C_6)alkyl aryl; and

n is 1.

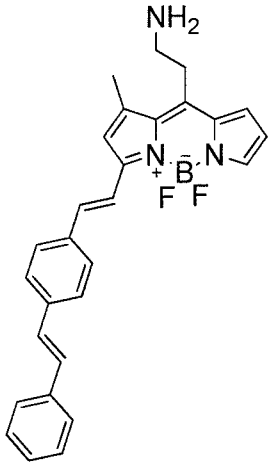
~~8. The method of Claim 7, wherein:~~

~~R is (CH=CH)phenyl.~~

~~9. The method of Claim 8, wherein:~~

~~each R_2 is independently H, halogen, (C_1-C_6)haloalkyl or (C_1-C_6)alkyl.~~

~~10.~~8. The method of Claim ~~9~~ 7, wherein the compound is represented by structural Formula (II):



(II).

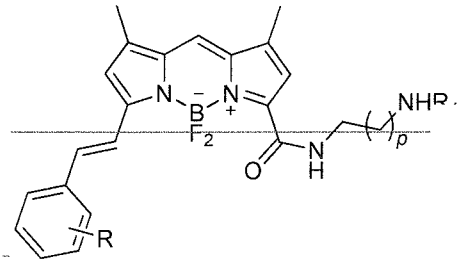
~~11. Use of the compound of Claim 1 as a fluorescent sensor.~~

~~12.~~9. A method for ~~detection of proteins by fluorescence analysis~~ visually detecting immunoglobulins in a sample, comprising:

a) ~~using a~~ incubating the immunoglobulins with the compound of Claim 1 under conditions sufficient to form an incubated mixture; and

b) exposing the incubated mixture to a wavelength of light sufficient to visualize the immunoglobulins using fluorescence spectroscopy.

~~13. A compound represented by structural Formula (III) or pharmaceutically acceptable salts thereof:~~



(III)

~~wherein:~~

each R is independently selected from H, OH, halogen, nitro, amino, $(C_1$-$C_6)$alkyl, $(C=O)(C_0$-$C_6)$alkyl, $NH(C=O)(C_0$-$C_6)$alkyl, OCF_3, $CH=CH(C_0$-$C_6)$alkylaryl, OC_1-C_6 alkenyl, $(C_0$-$C_6)$alkyl$CH=O$, $O(C_1$-$C_6)$alkyl, $S(C_1$-$C_6)$alkyl, $S(C_1$-$C_6)$haloalkyl, $O(C_1$-$C_6)$haloalkyl, $OCHF_2$, $O(C_0$-$C_6)$alkylamino, $(C_6$-$C_{10})$aryl, $(C_5$-$C_{10})$heteroaryl, $(C_5$-$C_{10})$heterocyclyl, $(C_1$-$C_6)$alkyl aryl, $O(C_0$-$C_6)$alkyl aryl, $O(CH_2)_m CHCH_2$ or 1-5 member polycyclyl, wherein each 1-5 member polycycle optionally and independently contains 1-2 ring heteroatoms selected from oxygen, nitrogen and sulfur;

n is 1, 2, 3 or 4;

m is 0, 1, 2, 3 or 4;

p is 1, 2, 3, 4, or 5;

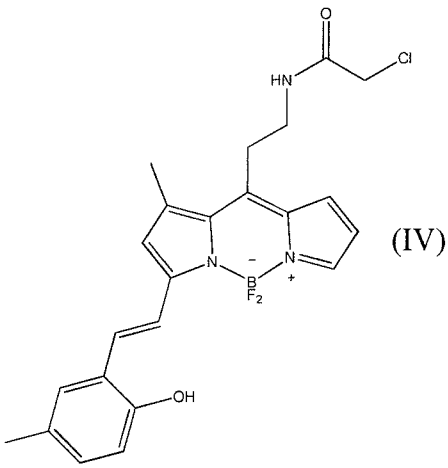
wherein, when n is 2 or greater, the R substituents may be optionally taken together to form a fused polycyclic aromatic ring system;

and wherein each R is optionally substituted with 1-4 R_2 substituents independently selected from:

$(C_1$-$C_6)$alkyl, halo$(C_0$-$C_6)$alkyl, hydroxy$(C_0$-$C_6)$alkyl, $(C_6$-$C_{10})$aryl, halo$(C_6$-$C_{10})$aryl, hydroxy$(C_6$-$C_{10})$aryl, $O(C_1$-$C_6)$alkyl, $O(C_1$-$C_6)$haloalkyl, $(C_3$-$C_8)$cycloalkyl, halo$(C_6$-$C_{10})$aryl$(C_1$-$C_6)$alkoxy, halogen, amino, $(C_1$-$C_6)$alkoxy$(C_6$-$C_{10})$aryl$(C_1$-$C_6)$alkoxy, nitro, hydroxy, halogen, $(C_0$-$C_6)$alkyl$(C_6$-$C_{10})$aryl$(C_0$-$C_6)$alkoxy, $(C_5$-$C_{10})$heterocycle, OCF_3, amino, $O(C_1$-$C_6)$alkylamino, $(C_6$-$C_{10})$aryl$(C_2$-$C_6)$alkenyl, $(C_2$-$C_6)$alkenyl$(C_1$-$C_6)$alkoxy, $(C_1$-$C_6)$sulfoxy, $(C=O)O(C_0$-$C_6)$alkyl or $N(CH_3)(C_1$-$C_6)OH$;

R_1 is H, $C=O(C_0$-$C_6)$haloalkyl, $C=O(C_0$-$C_6)$alkyl, $C=O(C_0$-$C_6)$alkylene or $C=O(C_6$-$C_{10})$aryl;

14.10. The compound of Claim 1, wherein the compound is represented by the structural Formula (IV)



(IV)

~~15. Use of compound of Claim 1 for cell imaging and cytometry applications.~~

~~16. Use of compound of Claim 13 for cell imaging and cytometry applications.~~

~~17.~~11. A method for staining stem cells, comprising:

a) ~~using a~~ incubating the stem cells with the compound of Claim 1 under conditions sufficient to form an incubated mixture; and

b) exposing the incubated mixture to a wavelength of light sufficient to visualize the stem cells using fluorescence spectroscopy.

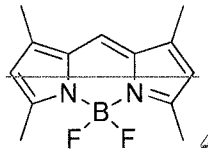
~~18. A method for the identification, detection, or fluorescence imaging of cells comprising using a compound of Claim 1 or of Claim 13.~~

~~19. The method of Claim 16, wherein the cells are mouse embryonic stem cells (mESC).~~

~~20. The method of Claim 17, wherein the cells are mouse embryonic stem cells (mESC).~~

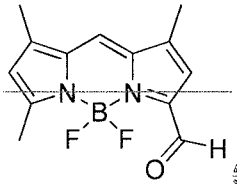
~~21. A method for a solid phase synthesis of a compound of structural Formula (III), comprising the steps of:~~

~~a) reacting 3,5-dimethylpyrrole-2-carboxaldehyde with 2,4-dimethylpyrrole to prepare tetramethylBODIPY (derivative 4):~~



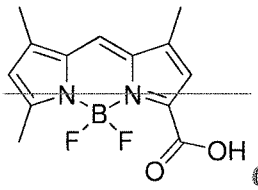
4;

b) reacting derivative 4 with an oxidant to obtain derivative 5:



5;

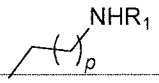
c) reacting derivative 5 with a second oxidant to form derivative 6;



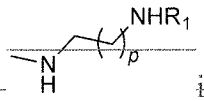
6;

d) coupling 6 with alkylenediamine bound to chlorotrityl chloride-polystyrene (CTC-PS) resin, such that the activated C_3-methyl group of the derivative is modified in a solid-phase adapted Knoevenagel-type reaction; and

e) extracting the compound of Formula (III) from step d) by a solid-phase extraction.

22. The compound of Claim 1, wherein the group 

is further modified with chemically reactive or photoreactive tags.

23. The compound of Claim 13, wherein the group 

is further modified with chemically reactive or photoreactive tags.

24. A method for detection of proteins by fluorescence analysis comprising using a compound of Claim 13.