CLAIMS

1. A device for use in luminescent imaging, the device comprising: a photonic superlattice comprising a first material,

the first material having a first refractive index,

the first material comprising first and second major surfaces and first and second pluralities of features defined though at least one of the first and second major surfaces, the features of the first plurality differing in at least one characteristic from the features of the second plurality;

and the photonic superlattice supporting propagation of a first wavelength and a second wavelength approximately at a first angle out of the photonic superlattice, the first and second wavelengths being separated from one another by a first non-propagating wavelength that does not selectively propagate at the first angle out of the photonic superlattice;

a second material having a second refractive index that is different than the first refractive index,

the second material being disposed within, between, or over the first and second pluralities of features and comprising first and second luminophores; and a first optical component disposed over one of the first and second major surfaces of the first material,

the first optical component receiving luminescence emitted by the first luminophore at the first wavelength approximately at the first angle, and

the first optical component receiving luminescence emitted by the second luminophore at the second wavelength approximately at the first angle.

2. The device of claim 1, wherein the first and second pluralities of features respectively comprise first and second pluralities of wells.

3. The device of claim 1, the second material further comprising third and fourth luminophores,

the photonic superlattice further supporting propagation of a third wavelength and a fourth wavelength approximately at the first angle out of the photonic superlattice, the third and

fourth wavelengths being separated from one another by a second non-propagating wavelength that does not selectively propagate at the first angle,

the optical component receiving luminescence emitted by the third luminophore at the third wavelength approximately at the first angle, and the optical component receiving luminescence emitted by the fourth luminophore at the fourth wavelength approximately at the first angle.

4. The device of claim 3, wherein the first luminophore is coupled to a first nucleic acid, the second luminophore is coupled to a second nucleic acid that is different than the first nucleic acid, the third luminophore is coupled to a third nucleic acid that is different than the first and second nucleic acids, and the fourth luminophore is coupled to a fourth nucleic acid that is different than the first, second, and third nucleic acids.

5. The device of claim 1, comprising a second optical component configured so as to transmit radiation to the photonic superlattice approximately at a second angle,

the first luminophore emitting the first wavelength responsive to the radiation transmitted by the second optical component, and

the second luminophore emitting the second wavelength responsive to the radiation transmitted by the second optical component.

6. The device of claim 5, wherein the second angle is approximately the same as the first angle or wherein the second angle is approximately orthogonal to the first angle.

7. The device of claim 5, wherein the first optical component is disposed over the first major surface of the first material, and wherein the second optical component is disposed over the second major surface of the first material.

8. The device of claim 5, further comprising a broadband excitation source configured to generate the radiation transmitted to the photonic superlattice by the second optical component.

9. The device of claim 1, further comprising at least one microfluidic feature in contact with the photonic superlattice and configured to provide a flow of one or more analytes to the first and second pluralities of features.

10. The device of claim 1, wherein the first optical component comprises an image sensor configured to image the received first and second wavelengths.

11. The device of claim 1, wherein the first material comprises a polymer or a glass, and/or wherein the second material comprises a fluid or a gel.

12. The device of claim 1, wherein the first luminophore is coupled to a first polynucleotide to be sequenced, and the second luminophore is coupled to a second polynucleotide to be sequenced.

13. The device of claim 12, further comprising: a first polymerase adding a first nucleic acid to a third polynucleotide that is complementary to and coupled to the first polynucleotide, the first nucleic acid being coupled to the first luminophore; and

a second polymerase adding a second nucleic acid to a fourth polynucleotide that is complementary to and coupled to the second polynucleotide, the second nucleic acid being coupled to the second luminophore.

14. The device of claim 13, further comprising a channel flowing a first liquid comprising the first and second nucleic acids and the first and second polymerases into, between, or over the first and second pluralities of features.

15. A method for use in luminescent imaging, the method comprising:

providing a photonic superlattice comprising a first material,

the first material having a first refractive index,

the first material comprising first and second major surfaces and first and second pluralities of features defined though at least one of the first and second major surfaces,

the features of the first plurality differing in at least one characteristic from the features of the second plurality;

the photonic superlattice supporting propagation of a first wavelength and a second wavelength approximately at a first angle out of the photonic superlattice, the first and second wavelengths being separated from one another by a first non-propagating wavelength that does not selectively propagate at the first angle out of the photonic superlattice;

providing a second material having a second refractive index that is different than the first refractive index,

the second material being disposed within, between, or over the first and second pluralities of features and comprising first and second luminophores;

providing a first optical component disposed over one of the first and second major surfaces of the first material;

receiving by the first optical component luminescence emitted by the first luminophore at the first wavelength approximately at the first angle; and

receiving by the first optical component luminescence emitted by the second luminophore at the second wavelength approximately at the first angle.

16. The method of claim 15, the second material further comprising third and fourth luminophores,

the photonic superlattice further supporting propagation of a third wavelength and a fourth wavelength approximately at the first angle out of the photonic superlattice, the third and fourth wavelengths being different than each of the first and second wavelengths and being separated from one another by a second non-propagating wavelength that does not selectively propagate at the first angle, the method further comprising:

receiving by the first optical component luminescence emitted by the third luminophore at the third wavelength approximately at the first angle; and

receiving by the first optical component luminescence emitted by the fourth luminophore at the fourth wavelength approximately at the first angle.

17. The method of claim 15, further comprising:

coupling the first luminophore to a first polynucleotide to be sequenced; and

coupling the second luminophore to a second polynucleotide to be sequenced.

18. The method of claim 17, further comprising:

by a first polymerase, adding a first nucleic acid to a third polynucleotide that is complementary to and coupled to the first polynucleotide, the first nucleic acid being coupled to the first luminophore; and

by a second polymerase, adding a second nucleic acid to a fourth polynucleotide that is complementary to and coupled to the second polynucleotide, the second nucleic acid being coupled to the second luminophore.

19. The method of claim 17, further comprising, after receiving by the first optical component the luminescence emitted by the first and second luminophores, respectively decoupling the first and second luminophores from the first and second polynucleotides to be sequenced.

20. The method of claim 19, further comprising, after respectively decoupling the first and second luminophores from the first and second polynucleotides to be sequenced:

flowing a second liquid comprising third and fourth nucleic acids and third and fourth polymerases into, between, or over the first and second pluralities of features, the third nucleic acid being coupled to the first luminophore, the fourth nucleic acid being coupled to the second luminophore; and

by the third polymerase, adding the third nucleic acid or the fourth nucleic acid to the third polynucleotide; or

by the fourth polymerase, adding the third nucleic acid or the fourth nucleic acid to the fourth polynucleotide.

21. A composition, comprising:

a photonic superlattice; and

a first nucleic acid in contact with the photonic superlattice,

wherein the photonic superlattice comprises a first material having a first refractive index,

the first material comprising first and second major surfaces and first and second pluralities of features defined though at least one of the first and second major surfaces,

the features of the first plurality differing in at least one characteristic from the features of the second plurality,

the photonic superlattice supporting propagation of a first wavelength and a second wavelength approximately at a first angle out of the photonic superlattice, the first and second wavelengths being separated from one another by a first non-propagating wavelength that does not selectively propagate at the first angle out of the photonic superlattice;

the composition further comprising a second material having a second refractive index that is different than the first refractive index,

the second material being disposed within, between, or over the first and second pluralities of features and comprising first and second luminophores,

the first luminophore being coupled to the first nucleic acid, and

the second luminophore being coupled to a second nucleic acid that is different than the first nucleic acid.

22. The composition of claim 21, wherein the photonic superlattice further is in contact with a microfluidic feature.

23. The composition of claim 21, wherein the photonic superlattice comprises a first material having a first refractive index, the first material comprising first and second

major surfaces and a plurality of features defined through at least one of the first and second major surfaces; and

wherein the composition further comprises:

a second material having a second refractive index that is different than the first refractive index; and

a third material having a third refractive index that is different than the first and second refractive indices,

the third material being disposed over at least some features of the plurality of features,

the second material being disposed over the third material.

24. The composition of claim 21, further comprising a luminophore coupled to the nucleic acid.