CLAIMS

1. An immersive optical projection device comprising:

a frame;

at least one projector array comprising

at least one image projection device;

at least one light source, wherein said light source is coupled to said projector array;

a reflector,

wherein said reflector is coupled to said frame; and

a projector array support,

wherein said at least one projector array is coupled to said projector array support and said projector array support is coupled to said frame,

such that a beam of light produced by said at least one light source is directed to said at least one image projection device, and said at least one image projection device controllably emits a luminous image, in at least one dimension, that further proceeds towards said reflector, whereupon, said reflector redirects said luminous image into an observer's eye.

2. The immersive optical projection device of claim 1 wherein said at least one image projection device is a scanning sub-projector configured to controllably steer said at least one beam of light with at least one degree of freedom.

3. The immersive optical projection device of claim 1 further comprising at least one beam modulator placed in an optical path between said at least one light source and said observer's eye, such that the amplitude, polarization state, wavelength, or degree of vergence of said beam of light impinging on said at least one beam modulator is selectively altered and further proceeds along said optical path.

4. The immersive optical projection device of claim 1 further comprising at least one observation channel.

5. The immersive optical projection device of claim 1 wherein said at least one image projection device is a multi-degree of freedom beam steering device.

6. The immersive optical projection device of claim 1 wherein said at least one projector array is a scanning projector.

7. The immersive optical projection device of claim 1 wherein said reflector is a revolved conic section having at least a partially reflective surface or a revolved asphere having at least a partially reflective surface.

8. The immersive optical projection device of claim 1 wherein said reflector is a refractive element having an at least partially reflective distal surface and a substantially transparent proximal surface such that said at least one beam of light passing through said refractive element and reflecting off said at least partially reflective distal surface is further directed towards said substantially transparent proximal surface and into said observer's eye.

9. The immersive optical projection device of claim 1 further comprising at least one integrated system module, wherein said at least one integrated system module is a data processor module, a power module, a wired communications module, a wireless communications module, an electro optical module, an inertial sensor module, a position sensor module, a speaker module, a camera module, or an eye tracking module, and said at least one integrated system module is coupled to said frame.

10. The immersive optical projection device of claim 1 further comprising:
at least one outward looking camera; and
at least one motion sensor,
wherein said at least one outward looking camera is affixed to a distal surface of said reflector and said at least one motion sensor is affixed to said frame.

11. The immersive optical projection device of claim 1 further comprising an array of individually controllable micromirrors disposed on a proximal surface of said reflector nearest said observer's eye, wherein each individually controllable micromirror of said array is configured to selectively control the angle of reflection of an impinging said beam of light.

12. The immersive optical projection device of claim 1 further comprising at least one said image projection device coupled to said frame such that said at least one image projection device controllably emits said luminous image, in at least one dimension, that further proceeds into said observer's eye.

13. The immersive optical projection device of claim 1 wherein said projector array support is a refractive corrector lens that is sealed against said reflector, thereby forming a sealed cavity protective of said reflector and said projector array, wherein said projector array is coupled to said refractive corrector lens and within said sealed cavity.

14. The immersive optical projection device of claim 1 further comprising a variable focus optical element array disposed on a proximal surface of said reflector nearest to said observer's eye, wherein each variable focus optical element of said variable focus optical element array is configured to control the vergence of an impinging beam of light.

15. An immersive optical projection device comprising:

a frame;

at least one scanning projector, wherein said at least one scanning projector is further comprised of at least one multi-degree of freedom steerable micromirror;

at least one light source, wherein said light source is coupled to said scanning projector;

a revolved conic section reflector surface or aspheric reflector surface;

an array of individually controllable micromirrors, wherein said array of individually controllable micromirrors is disposed on said revolved conic section reflector surface or said aspheric reflector surface; and

a refractive element coupled to said frame,

wherein said refractive element is sealed against said revolved conic section reflector surface or said aspheric reflector surface, thereby forming a sealed cavity protective of said revolved conic section reflector surface, or said aspheric reflector surface and said at least one scanning projector,

wherein said at least one scanning projector is coupled to said refractive element and within said sealed cavity,

such that a beam of light produced by said at least one light source is directed to said at least one multi-degree of freedom steerable micromirror, and said at least one multi-degree of freedom steerable micromirror controllably emits a luminous image, in at least one dimension, that further proceeds towards said array of individually controllable micromirrors, and is further directed through said refractive element into an observer's eye.

16. An immersive optical projection device comprising:
a support structure;
at least one micro scanner direct projection optical element comprising:
    at least one light source;
    at least one multi-dimensional image projection device; and
    a projection optical element,
wherein said at least one multi-dimensional image projection device is coupled to said support structure,
and said at least one light source, said at least one multi-dimensional image projection device and said projection optical element are coupled with respect to one another such that a beam of light produced by said at least one light source is directed to said at least one multi-dimensional image projection device, and said at least one multi-dimensional image projection device controllably emits a luminous image in at least one dimension, that further proceeds through said projection optical element, whereupon said luminous image is projected towards an observer's eye.

17. The immersive optical projection device of claim 16 further comprising:
a light isolation housing,
wherein said at least one multi-dimensional image projection device is affixed to an interior wall of said light isolation housing and said projection optical element is sealed against an opposing open side of said light isolation housing, such that a sealed cavity protective of said at least one multi-dimensional image projection device and one side of said projection optical element is formed,
such that said luminous image emitted by said at least one multi-dimensional image projection device passes through said projection optical element and away from said light isolation housing towards said observer's eye.

18. The immersive optical projection device of claim 16 wherein said at least one multi-dimensional image projection device is a scanning projector that can steer said beam of light with at least one degree of freedom.

19. The immersive optical projection device of claim 16 further comprising at least one beam modulator placed in an optical path between said light source and said observer's eye, such that the amplitude, polarization state, wavelength, or degree of vergence of said beam of light impinging on said at least one beam modulator is selectively altered and further proceeds along said optical path.

20. The immersive optical projection device of claim 16 wherein said at least one micro scanner direct projection optical element comprises a plurality of micro scanner direct projection optical elements arrayed in two dimensions on surface of said support structure such that a screen of sufficient size is created for direct viewing by one or more observers.