CLAIMS

1. A system comprising; a plurality of modular subassemblies and a plate; wherein each modular subassembly comprises an enclosure and a plurality of optical components aligned to the enclosure, and each enclosure comprises a plurality of mounting structures; and wherein each modular subassembly is mechanically coupled to the plate by attachment of a mounting structure of a modular subassembly directly to a corresponding mounting structure located on the plate, such that by mechanically coupling each modular subassembly to the plate using the mounting structure of a respective modular subassembly and the corresponding mounting structure on the plate, adjacent modular subassemblies are aligned to each other upon such attachment, and wherein two of the modular subassemblies mechanically coupled to the plate are also attached to each other by mechanically coupling a precision alignment structure on one of the two modular subassemblies to a respective alignment structure on the other of the two modular subassemblies; wherein a first one of the modular subassemblies comprises a first light source operating at a first wavelength, a second light source operating at a second wavelength, and a single beam shaping lens aligned to the first light source and second light source such that light beams output from the first light source and the second light source are directed through the single beam shaping lens; and wherein a second one of the modular subassemblies comprises an objective lens optically coupled to the single beam shaping lens in the first one of the modular subassemblies, and a tube lens optically coupled to the objective lens, the objective lens to focus light onto a flow cell positioned at a predetermined distance from the objective lens.

2. The system of claim 1, wherein the first wavelength is a green wavelength or a blue wavelength, the second wavelength is a green wavelength or a red wavelength, and the beam shaping lens is a Powell lens.

3. The system of claim 1, wherein the objective is to articulate along a longitudinal axis to move a focal point of the objective with respect to one or more surfaces of the flow cell.

4. The system of claim 1, wherein the flow cell comprises a translucent cover plate, a

substrate, and a liquid sandwiched therebetween, and a biological sample is located at an inside surface of the translucent cover plate or an inside surface of the substrate.

5. The system of claim 4, wherein the biological sample comprises a DNA sample or an RNA sample.

6. The system of claim 1, wherein a further one of the modular subassemblies comprises a focus tracking light source and a focus tracking sensor: wherein the focus tracking light source is to generate a focus tracking light beam, and transmit the focus tracking light beam through the plurality of optical components such that the focus tracking light beam terminates at the focus tracking sensor; and the focus tracking sensor is communicatively coupled to a processor and a non-transitory computer readable medium with machine-readable instructions stored thereon, the machine-readable instructions, when executed, cause the processor to: receive an output signal from the focus tracking sensor; and analyze the output signal to determine a set of characteristics of the focus tracking light beam.

7. The system of claim 6, wherein the machine-readable instructions, when executed, further cause the processor to generate a feedback signal indicating that one or more of the optical components should be reconfigured to optimize the set of characteristics of the focus tracking light beam.

8. The system of claim 1, wherein at least one of the modular subassemblies is a field replaceable unit.

9. The system of claim 1, wherein the plurality of structures comprises one of a slot, a datum, a tab, a pin, or a recessed cavity.

10. The system of claim 1, wherein a further one of the modular subassemblies comprises a plurality of optical sensors wherein each optical sensor is oriented to receive and detect a fluorescent light beam emitted from an optical target triggered in response to a light beam emitted from one of the light sources.

11. The system of claim 1, wherein each modular subassembly is assembled and configured prior to being mechanically coupled to the plate.

12. A method comprising: disposing a plurality of light sources and a single beam shaping lens within a first enclosure; aligning the single beam shaping lens to the plurality of light sources such that light beams output from each of the plurality of light sources are directed through the single beam shaping lens; disposing a tubular lens and an objective within a second enclosure; disposing a plurality of optical sensors within a third enclosure; disposing a focus tracking light source and a focus tracking optical sensor within a fourth enclosure; mounting each of the first enclosure, the second enclosure, the third enclosure, and the fourth enclosure to a plate such that the objective lens within the second enclosure is optically coupled to the single beam shaping lens within the first enclosure, wherein mounting the first enclosure, the second enclosure, the third enclosure and the fourth enclosure to the plate comprises attaching a mounting structure from each of the first enclosure, the second enclosure, the third enclosure and the fourth enclosure to its corresponding mounting structure located on the plate such that adjacent enclosures of the first enclosure, the second enclosure, the third enclosure and the fourth enclosure are aligned to each other upon such attachment; attaching two selected enclosures of the first enclosure, the second enclosure, the third enclosure and the fourth enclosure to each other by mechanically coupling a precision alignment structure on one of the two selected enclosures to a respective alignment structure on the other of the two selected enclosures; generating a focus tracking light beam with the focus tracking light source; and transmitting the focus tracking light beam through the objective such that the focus tracking light beam reflects off a flow cell oriented at a predetermined distance from a distal end of the objective.

13. The method of claim 12, further comprising testing and aligning the plurality of light sources and the single beam shaping lens to the first enclosure before mounting the first enclosure to the plate.

14. The method of claim 12, further comprising: receiving a reflection of the focus tracking light beam at the focus tracking sensor; generating a feedback signal using the focus

tracking sensor; and reorienting the tube lens, the objective, or the second enclosure, in response to the feedback signal.

15. The method of claim 14 further comprising articulating the objective along a longitudinal axis to move a focal point of the objective with respect to one or more surfaces of the flow cell.

16. The method of claim 14, further comprising fabricating the flow cell by sandwiching a liquid between a translucent cover plate and a substrate, and disposing a biological sample on the one or more surfaces of the flow cell.

17. The method of claim 16, further comprising locating the biological sample at a top surface and a bottom surface of the liquid, wherein the biological sample comprises a DNA sample or an RNA sample.

18. The method of claim 12, wherein the first enclosure, the second enclosure, the third enclosure and the fourth enclosure are assembled and configured prior to being mounted to the plate.